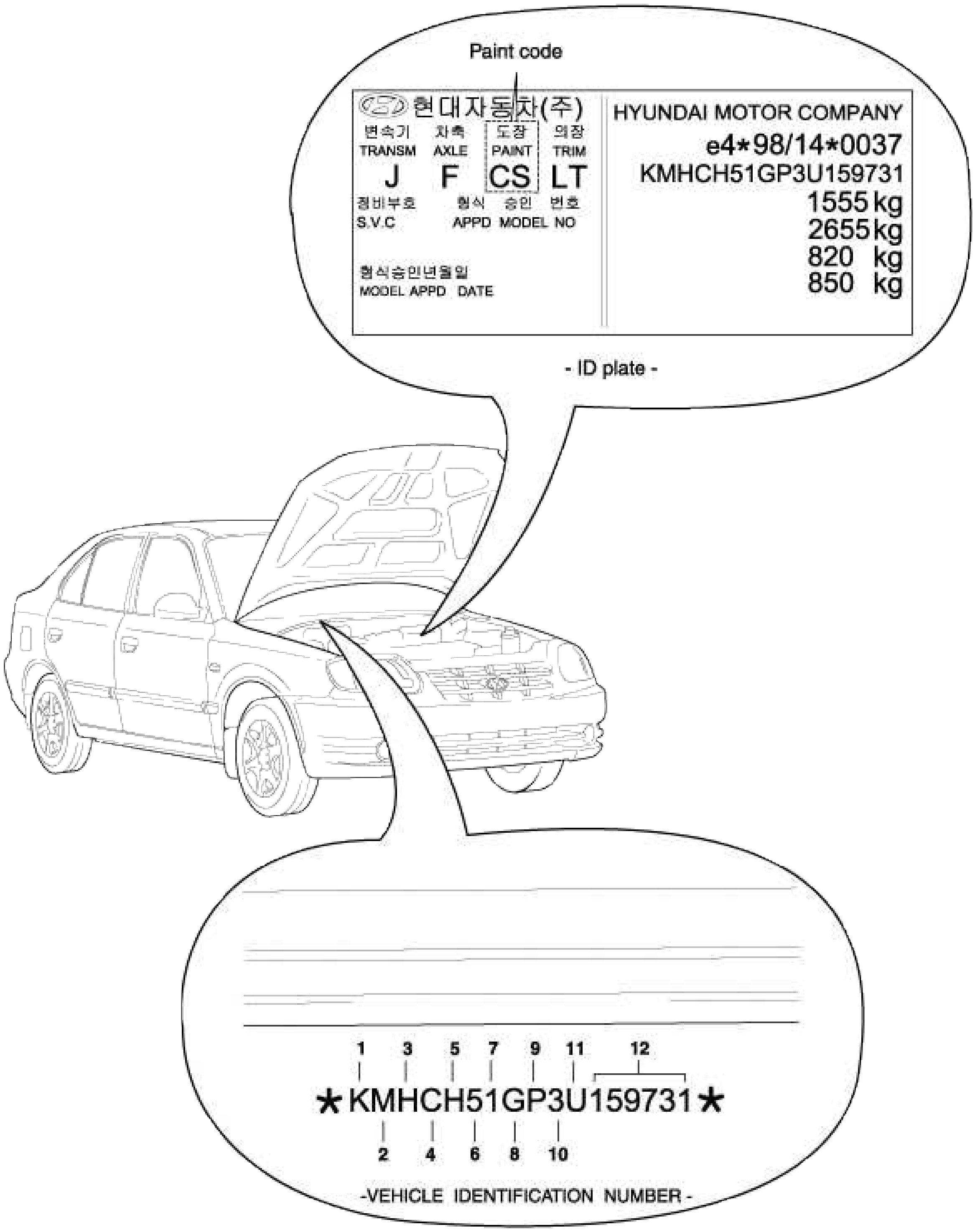
ACCENT(LC) > 2002 > G 1.5 SOHC > General Information

General Information > General Information > General Information

IDENTIFICATION NUMBER

VEHICLE IDENTIFICATION NUMBER LOCATION


Paint code
현대자동차(주)
변속기
TRANSM
차축
AXLE
도장
PAINT
의장
TRIM
J
F
CS
LT
정비부호
S.V.C
형식 승인 번호
APPD MODEL NO
형식승인년월일
MODEL APPD DATE
HYUNDAI MOTOR COMPANY
e4*98/14*0037
KMHCH51GP3U159731
1555 kg
2655 kg
820 kg
850 kg
- ID plate -
1 3 5 7 9 11 12
★KMHCH51GP3U159731★
2 4 6 8 10
-VEHICLE IDENTIFICATION NUMBER -

VEHICLE IDENTIFICATION NUMBER DESCRIPTION

1. Geographic zone
   K : Korea

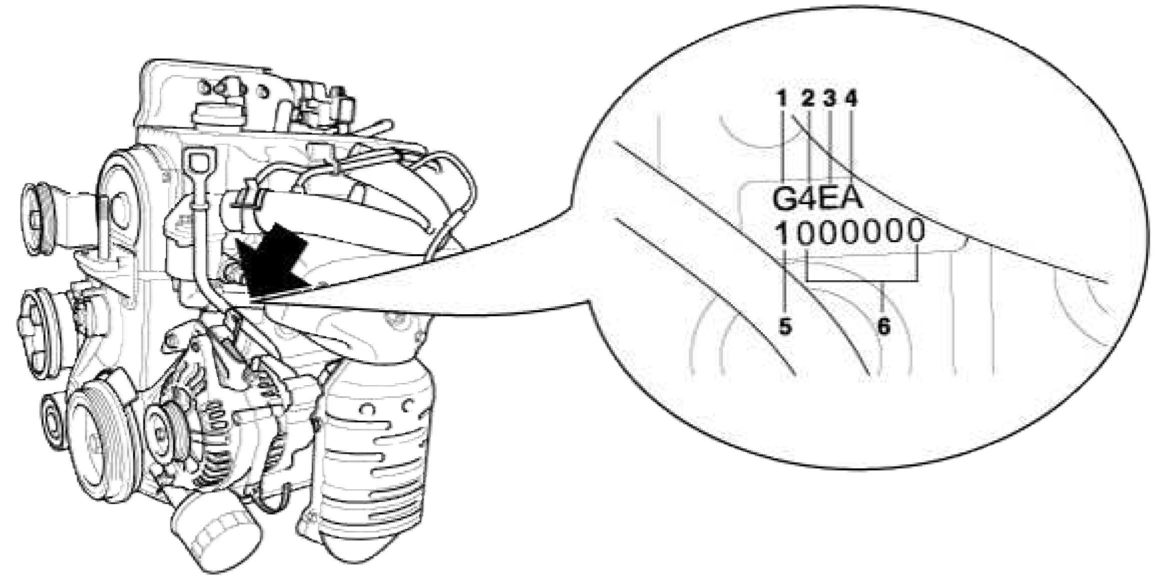
2. Manufacturer
   M : Hyundai motor company
3. Vehicle type
   H : Passenger
4. Vehicle line
   C : Accent
5. Model & Series
   F : STANDAD (L)
   G : DELUXE (GL)
   H : SUPER DELUXE (GLS)
6. Body type
   3 : Sedan 3 - Door
   4 : Sedan 4 - Door
7. Restraint system
   3 : Drive side & Passenger side - Active belt + Airbag
   Passenger side - Active belt or passive belt
   4 : Both side - Active belt + Airbag
   5 : Depowered - Airbag
8. Engine type
   C : Gas 1.6 DOHC
   G : Gas 1.5 SOHC
9. Driver side
   P : LHD, R : RHD
10. Production year
    2 : 2002, 3 : 2003, 4 : 2004, 5 : 2005
11. Plant of production
    U : Ulsan (Korea)
12. Vehicle production sequence number
    000001 ~ 999999

PAINT CODE

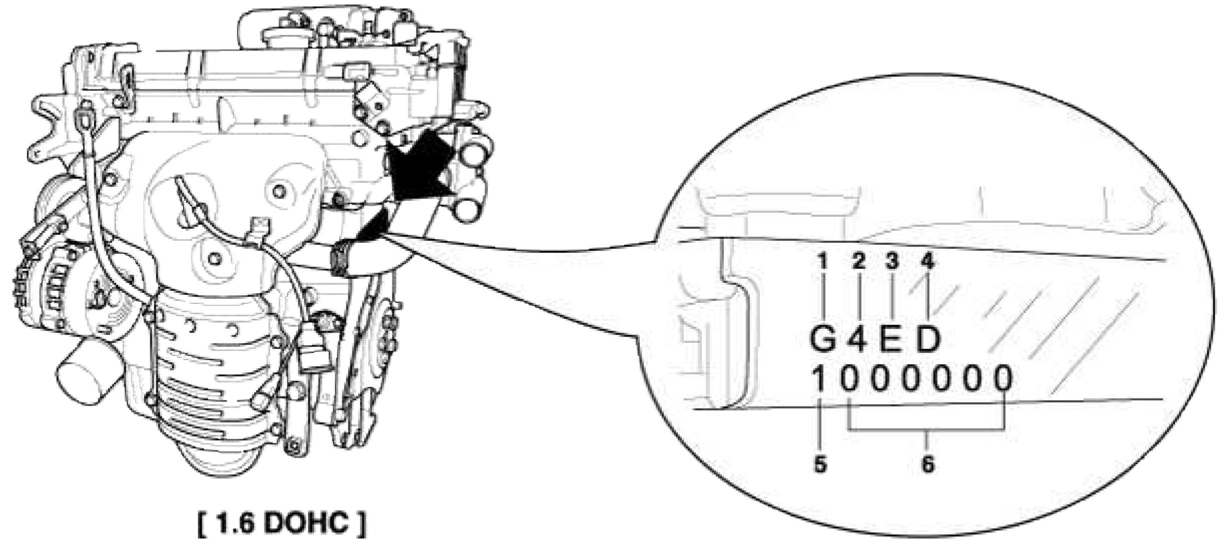
CODE	COLOR
NW	Noble White
EB	Ebony Black
CS	Clean Silver
HL	Hiphop Red
IA	Vivid Yellow
YA	Potomac Blue
TI	Tundra Green
UA	Hot Gold
WS	Technical Gray
ZG	Mass Green

ENGINE IDENTIFICATION NUMBER LOCATION

tomsn048@gmail.com


1 2 3 4
G4EA
1000000
5
6

[1.5 SOHC]

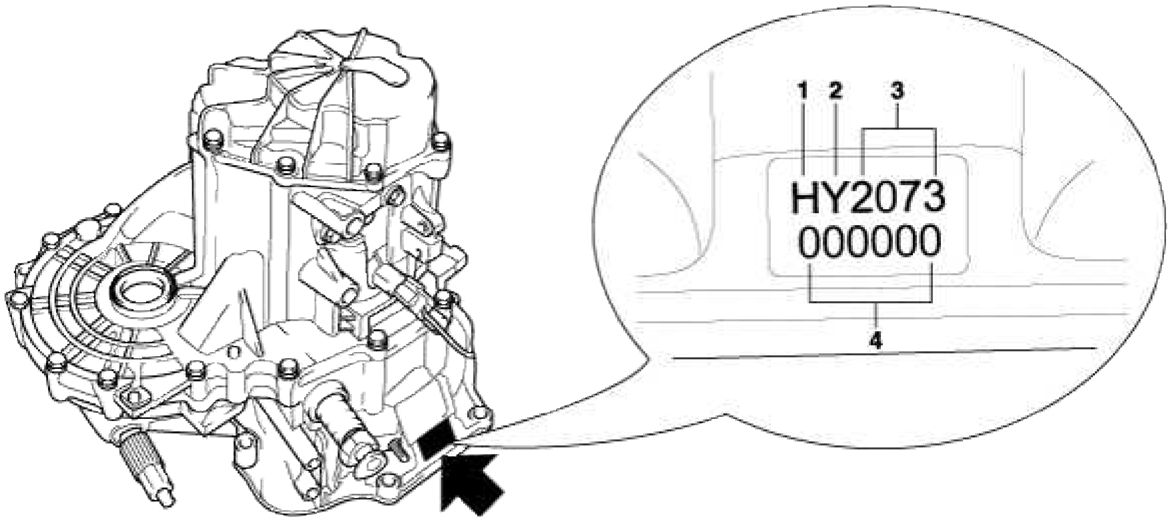

1 2 3 4
G4ED
1000000
5
6

[1.6 DOHC]

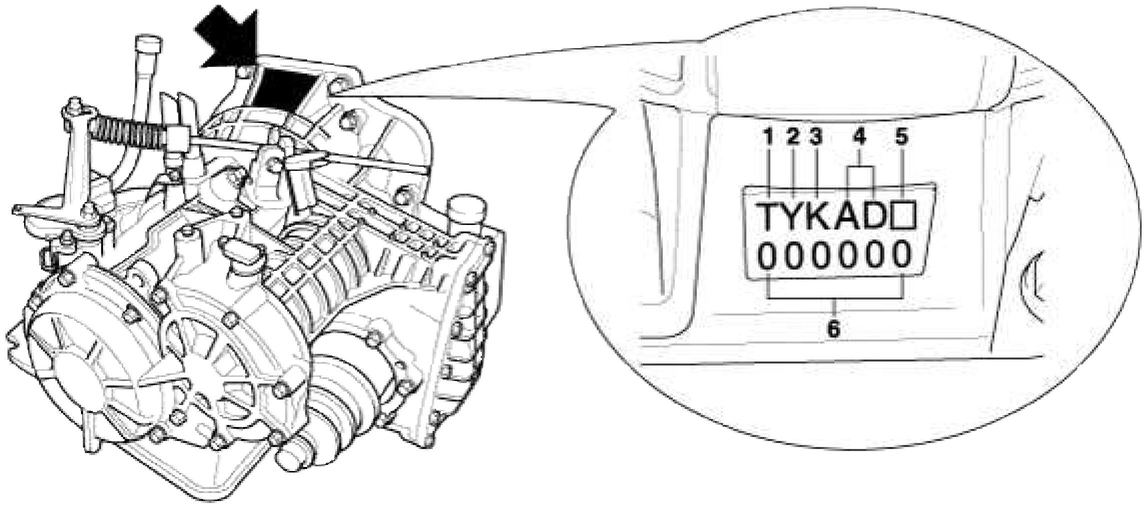
ENGINE IDENTIFICATION NUMBER DESCRIPTION

1. Engine fuel
   G : Gasoline
2. Engine range
   4 : In line 4 cycle 4 cylinder
3. Engine development order
   E : Alpha engine
4. Engine capacity
   B : 1495 cc
   D : 1599 cc
5. Production year
   1 : 2001, 2 : 2002, 3 : 2003, 4 : 2004
6. Engine production sequence number
   000001 ~ 999999

TRANSAXLE IDENTIFICATION NUMBER LOCATION


1 2 3
HY2073
000000
4

[MANUAL TRANSAXLE]


1 2 3 4 5
TYKAD□
000000
6

[AUTOMATIC TRANSAXLE]

TRANSAXLE IDENTIFICATION NUMBER DESCRIPTION

1. Model
   H : M5AF3
2. Production year
   W - 1998, X - 1999, Y - 2000, 1 - 2001,
   2 - 2002, 3 - 2003, 4 - 2004, 5 - 2005
3. Gear ratio
   2073 : 3.650
4. Transaxle production sequence number
   000000 ~ 999999

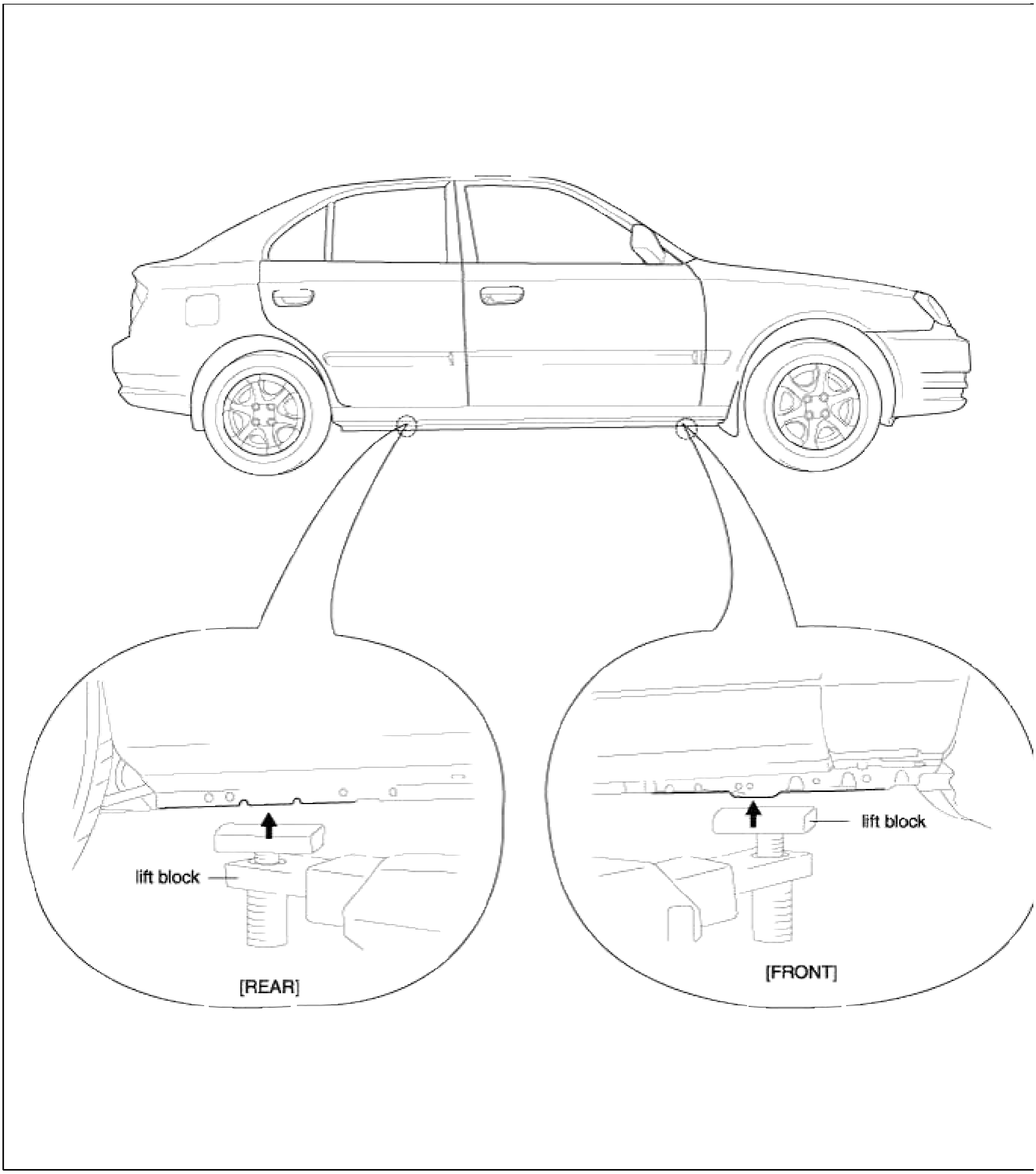
1. T : A4AF3
2. Production year
   W - 1998, X - 1999, Y - 2000, 1 - 2001,
   2 - 2002, 3 - 2003, 4 - 2004, 5 - 2005

tomsn048@gmail.com

3. Gear ratio
   K : 3.443
   L : 3.656
   N : 4.041
4. Detailed classification
   AD : 1.5 SOHC
   ID : 1.6 DOHC
5. Spare
6. Transaxle production sequence number
   000000 ~ 999999

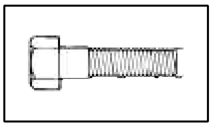
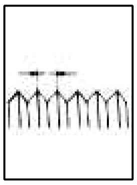
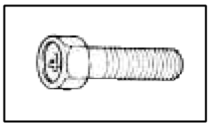
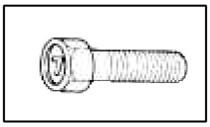
LIFT SUPPORT POINT

1. Place the lift blocks under the support points as shown in the illustration.
2. Raise the hoist a few inches and rock the vehicle to be sure it is firmly supported.
3. Raise the hoist to full height to inspect the lift points for secure support.


lift block
[REAR]
lift block
[FRONT]

TIGHTENING TORQUE TABLE OF STANDARD PARTS

tomsn048@gmail.com

Bolt nominal diameter (mm)	Pitch (mm)	Torque Nm (kg.cm, lb.ft)	
		Head Mark 4	Head Mark 7
			
M5	0.8	3 ~ 4 (30 ~ 40, 2.2 ~ 2.9)	5 ~ 6 (50 ~ 60, 3.6 ~ 4.3)
M6	1.0	5 ~ 6 (50 ~ 60, 3.6 ~ 4.3)	9 ~ 11 (90 ~ 110, 6.5 ~ 8.0)
M8	1.25	12 ~ 15 (120 ~ 150, 9 ~ 11)	20 ~ 25 (200 ~ 250, 14.5 ~ 18.0)
M10	1.25	25 ~ 30 (250 ~ 300, 18 ~ 22)	30 ~ 50 (300 ~ 500, 22 ~ 36)
M12	1.25	35 ~ 45 (350 ~ 450, 25 ~ 33)	60 ~ 80 (600 ~ 800, 43 ~ 58)
M14	1.5	75 ~ 85 (750 ~ 850, 54 ~ 61)	120 ~ 140 (1,200 ~ 1,400, 85 ~ 100)
M16	1.5	110 ~ 130 (1,100 ~ 1,300, 80 ~ 94)	180 ~ 210 (1,800 ~ 2,100, 130 ~ 150)
M18	1.5	160 ~ 180 (1,600 ~ 1,800, 116 ~ 130)	260 ~ 300 (2,600 ~ 3,000, 190 ~ 215)
M20	1.5	220 ~ 250 (2,200 ~ 2,500, 160 ~ 180)	360 ~ 420 (3,600 ~ 4,200, 260 ~ 300)
M22	1.5	290 ~ 330 (2,900 ~ 3,300, 210 ~ 240)	480 ~ 550 (4,800 ~ 5,500, 350 ~ 400)
M24	1.5	360 ~ 420 (3,600 ~ 4,200, 260 ~ 300)	610 ~ 700 (6,100 ~ 7,000, 440 ~ 505)

NOTE

1. The torques shown in the table are standard values under the following conditions :
    - Nuts and bolts are made of galvanized steel bar.
    - Galvanized plain steel washers are inserted.
    - All nuts, bolts, and plain washers are dry.
2. The torques shown in the table are not applicable :
    - When spring washers, toothed washers and the like are inserted.
    - If plastic parts are fastened.
    - If self - tapping screws or self - locking nuts are used.
    - If threads and surfaces are coated with oil.
3. If you reduce the torques in the table to the percentage inddcated below, under the following conditions, if will be the standard value.
    - If spring washers are used. : 85%
    - If threads and braring sufaces are stained with oil : 85%

LUBRICANTS

RECOMMENDED LUBRICANTS

Parts	Specifications
Engine oil	API Classification SG Above (SAE 10W/30, 5W/30) API Classification SH Above (SAE 7.4W/30)
Manual transaxle	API Classification GL - 4 (SAE 75W/90)
Automatic transaxle	GENUINE HYUNDAI transaxle oil, GENUINE DIAMOND ATF SP - III
Brake	DOT 3 or DOT 4
Cooling system	High quality ethylene glycol - Concentration level 40% (tropical) - Concentration level 50% (tropical)
Power steering	PSF - 3
Transaxle linkage, parking brake cable mechanism, hood lock and hook, door latch, seat adjuster, tailgate latch, door hinges, tailgate hinges	Multipurpose grease NLGI grade #2

WARNING

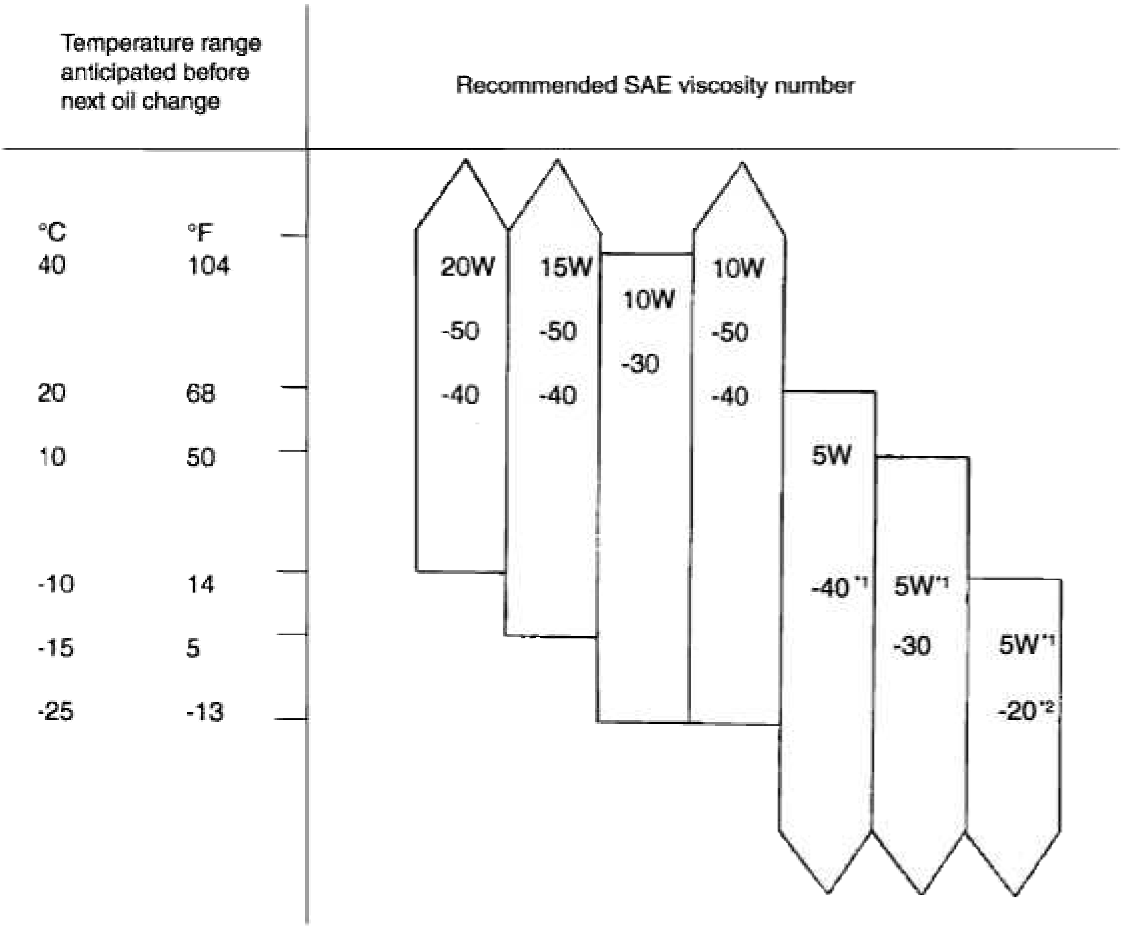
- Always use GL - 4 Classification for the manual transaxle (Do not use GL - 5 Classification)
- Always use Genuine Hyundai parts and recommended fluid.
  Using any other type of parts and fluid can cause serious damage of the vehicle.

LUBRICANTS CAPACITIES

Description		Capacities
		1.5/1.6
Engine oil	Oil pan	3.0 (3.17, 2.64)
	Oil filter	0.3 (0.32, 0.26)
	Total	3.3 (3.49, 2.90)
Cooling system		6.5 (6.87, 5.72)
Manual transaxle		2.5 (2.27, 1.89)
Automatic transaxle		6.1 (6.45, 5.37)
Power steering		0.9 (0.95, 0.79)
		liter (U.S. qus., lmp.qts.)

SELECTION OF ENGINE OIL

tomsn048@gmail.com

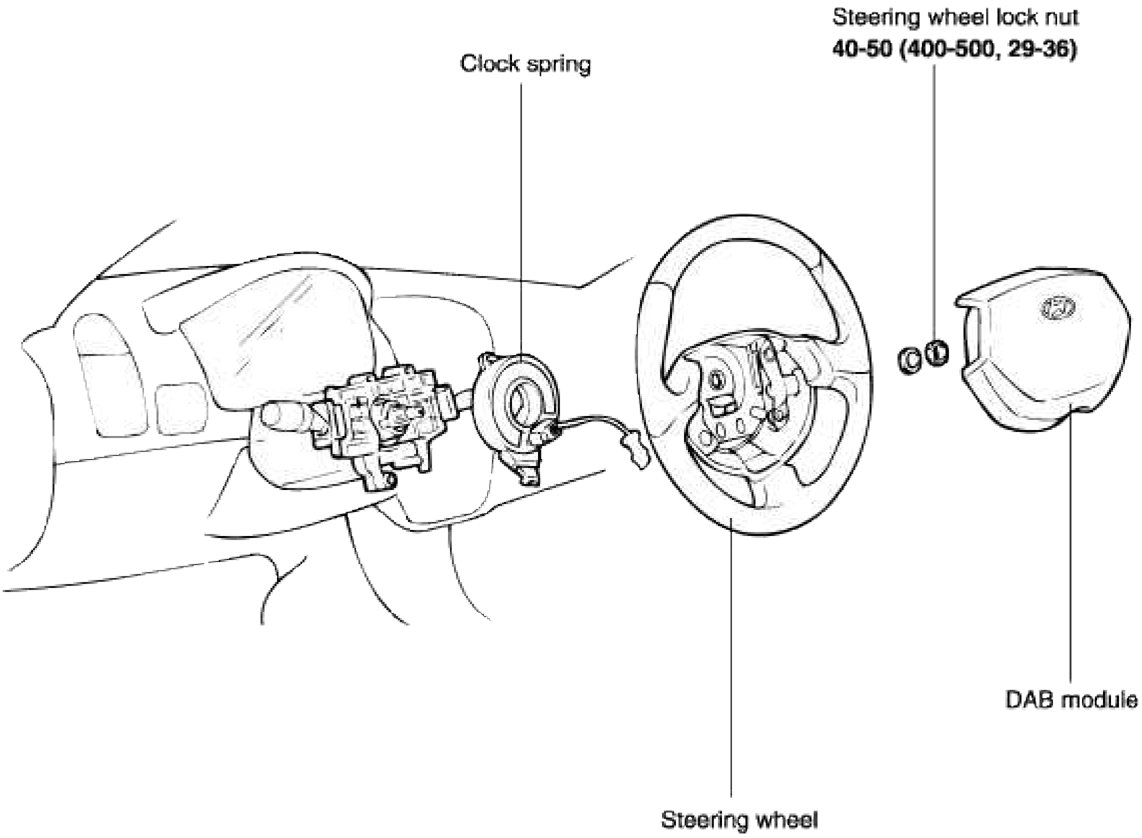


*1 **Restricted by driving condition and environment.**
*2 **Not recommended for sustained high speed vehicle operation**

NOTE

1. Satisfy the requirements of the API classification.
2. Have the proper SAE grade number for expected ambient temperature range.

SRS SYSTEM COMPONENTS INFORMATION



TORQUE : Nm (kg·m, lb·t)

CUSTOMER CAUTIONS

1. Work must be started approx. 30 seconds or longer after the ignition switch is turned to the LOCK position and the negative (-) battery cable is disconnected. (The airbag system is equipped with a back - up power source. If work is started within 30 seconds when disconnecting the negative (-) battery cable of the battery, the airbag may be operative.)
   When the negative (-) terminal cable is disconnected from the battery, the clock and audio systems memories will be erased. Before starting work, record the setting of the audio memory system
   When work is finished, reset the audio system as before and adjust the clock.
2. Malfunction symptoms of the airbag system are difficult to comfirm, so diagnostic codes become the most important sourceof information when troubleshooting. When troubleshooting the airbag system, always read the diagnostic trouble coodes before disconnecting the battery.

3. Never use airbag parts from another vehicle. When replacing parts, replace them with new parts.
4. Never attempt to disassemble and repair the airbag modules, SRSCM, clock spring and Airbag wiring harness in order to reuse it.
5. If the SRSCM or airbag module have been dropped, or if there are cracks, dents or other defects in the case, bracket or connector, replace them with new ones.
6. After work on the airbag system is completed, reset the airbag warning lamp.

GENERAL SERVICE INFORMATION

CAUTION

The support rod must be inserted into the hole near the edge of the hood whenever you inspect the engine compartment to prevent the hood from falling and causing possible injury.

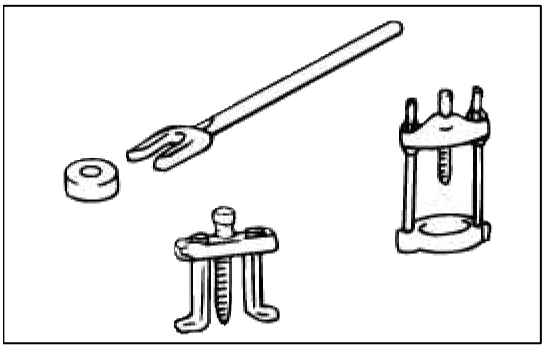
Make sure that the support rod has been released prior to closing the hood. Always check to be sure the hood is firmly latched before driving the vehicle.

PREPARATION OF TOOLS AND MEASURING EQUIPMENT

Be sure that all necessary tools and measuring equipment are available before starting work.

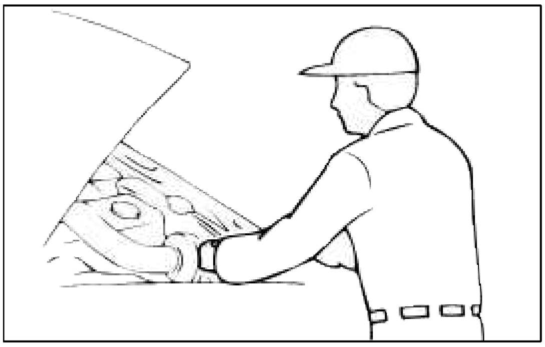
SPECIAL TOOLS

Use special tools when they are required.



REMOVAL OF PARTS

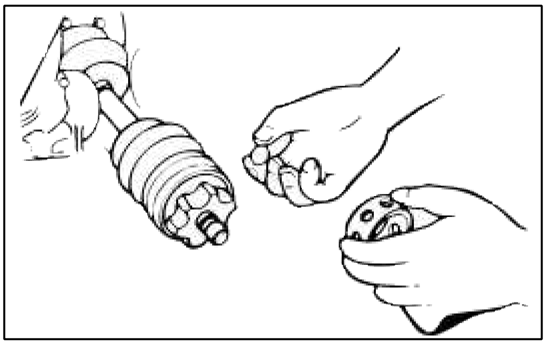
First find the cause of the problem and then determine whether removal or disassembly is required before starting the job.



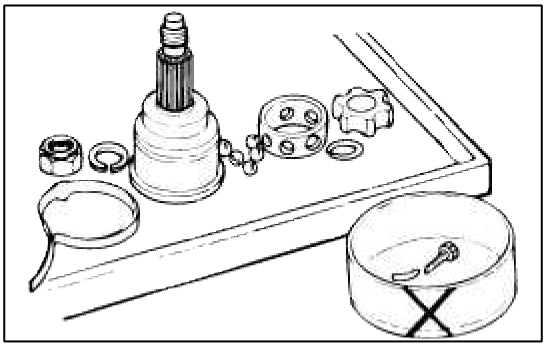
DISASSEMBLY

If the disassembly procedure is complex, requiring many parts to be disassembled, all parts should be disassembled in a way that will not affect their performance or external appearance.

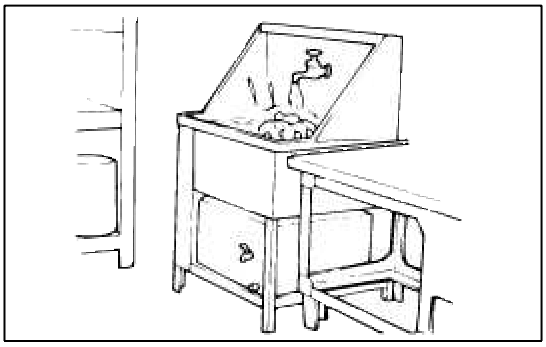
1. **Inspection of parts**
   Each part, when removed, should be carefully in spected for malfunction, deformation, damage, and other problems.



2. **Arrangement of parts**
   All disassembled parts should be carefully arranged for effective reassembly.
   Be sure to separate and correctly identify the parts to be replaced from those that will be used again.

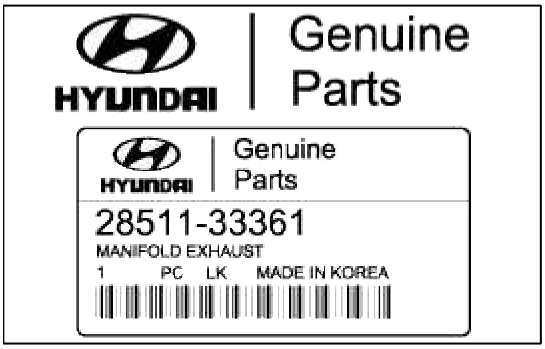


3. **Cleaning parts for reuse**
   All parts to be used again should be carefully and thoroughly cleaned by an appropriate method.

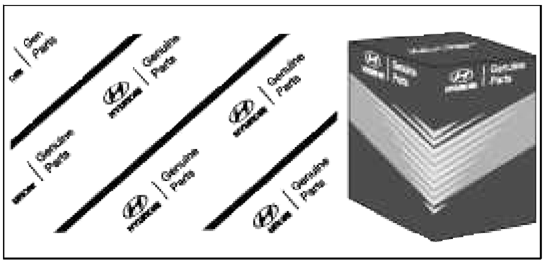


PARTS

When replacing parts, use HYUNDAI genuine parts.


HYUNDAI
Genuine Parts
HYUNDAI
Genuine Parts
28511-33361
MANIFOLD EXHAUST
1 PC LK MADE IN KOREA

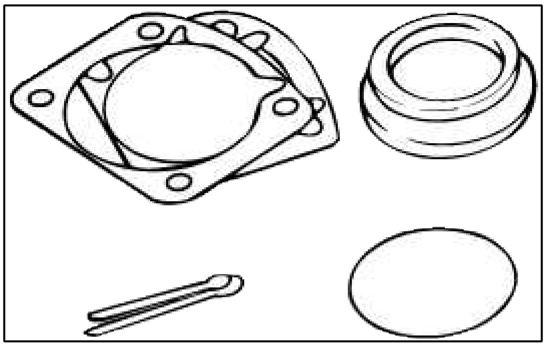
tomsn048@gmail.com



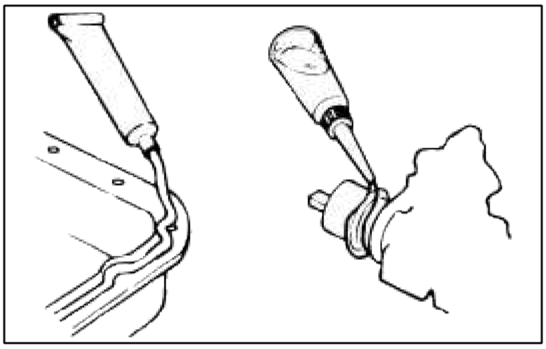
REPLACEMENT

Standard values, such as torques and certain adjustments, must be strictly observed in the reassembly of all parts. If removed, the following parts should always be replaced with new ones.

1. Oil seals
2. Gaskets
3. O-rings
4. Lock washers
5. Cotter pins (split pins)
6. Plastic nuts



7. Selalant should be applied to gaskets.
8. Oil should be applied to the moving components of parts.
9. Specified oil or grease should be applied to the prescribed locations (oil seals, etc.) before assembly.



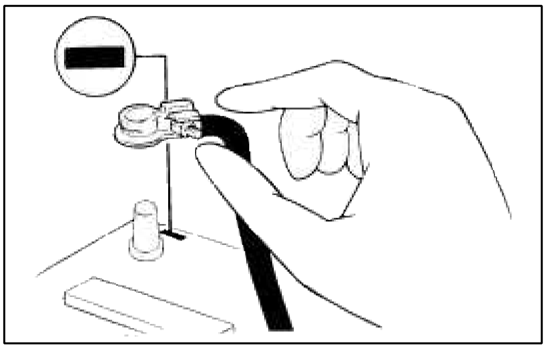
ADJUSTMENT

Use gauges and testers to adjust correctly the parts to standard values correctly.

ELECTRICAL SYSTEM

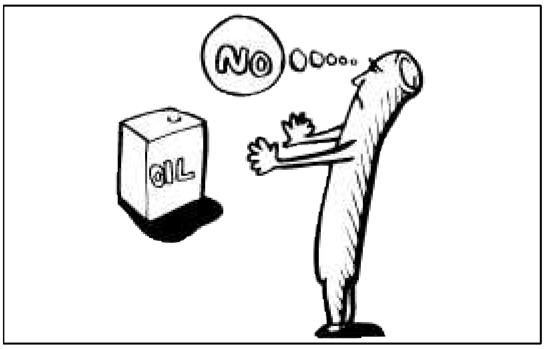
1. Be sure to disconnect the battery cable from the negative (-) terminal of the battery.
2. Never pull on the wires when disconnecting connectors.
3. Locking connectors will click when the connector is secure.

4. Handle sensors and relays carefully. Be careful not to drop them or hit them against other parts.



RUBBER PARTS AND TUBES

Always prevent gasoline or oil from touching rubber parts or tubing.

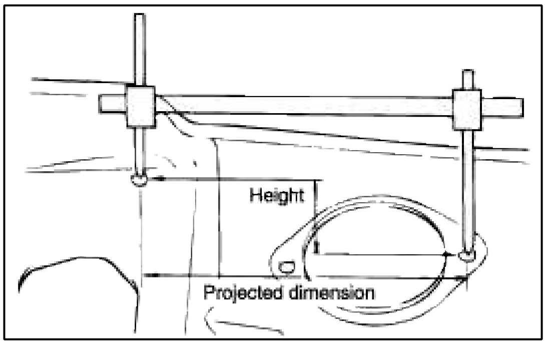


MEASURING BODY DIMENSIONGS

1. Basically, all measurements in this manual are taken with a tracking gauge.
2. When a measuring tape is used, check to be sure there is no elongation, twisting or bending.
3. For measuring dimensions, both projected dimensions and actual - measurement dimensions are used in this manual.

DIMENSIONS PROJECTED

1. These are the dimensions measured when the measurement points are projected from the vehicle's surface, and are the reference dimensions used for body alterations.
2. If the length of the tracking gauge probes is adjustable, measure it by lengthening one of two probes as long as the different value in height of the two surfaces.



MEASURING ACTUAL DIMENSIONS

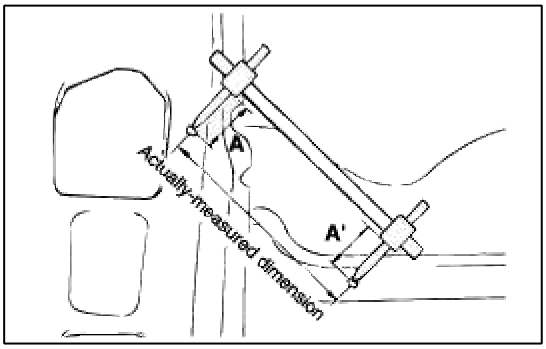
1. These dimensions indicate the actual linear distance between measurement points, and are used as the reference dimensions when a tracking gauge is used for measurement.

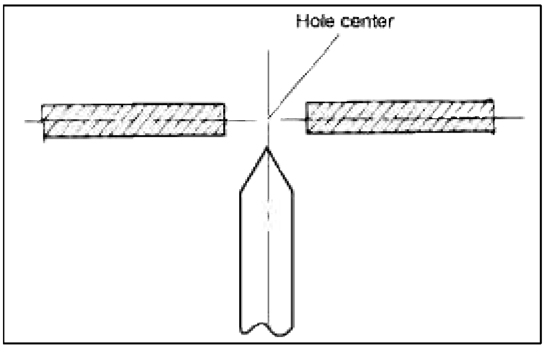
tomsn048@gmail.com

2. First adjust both probes to the same length (A=A') before measurement.

NOTE

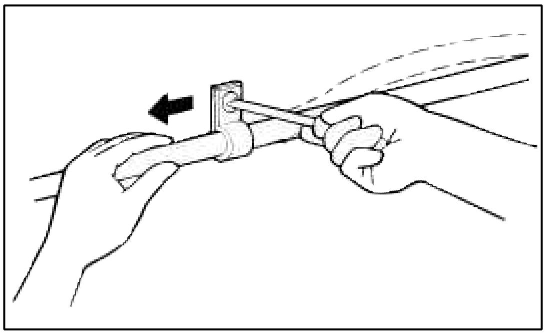
Check the probes and gauge itself to make sure there is no free play.





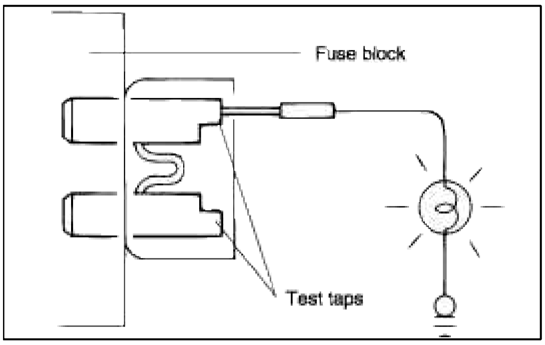
CHECKING CABLES AND WIRES

1. Check the terminal for tightness.
2. Check terminals and wires for corrosion from battery electrolyte, etc.
3. Check terminals and wires for open circuits.
4. Check wire insulation and coating for damage, cracks and degrading.
5. Check the conductive parts of terminals for contact with other metallic parts (vehicle body and other parts).
6. Check grounded parts to verify that there is complete continuity between their attaching bolt(s) and the vehicle's body.
7. Check for incorrect wiring.
8. Check that the wiring is so clamped to prevent contact with sharp corners of the vehicle body, etc. or hot parts (exhaust manifold, etc.)
9. Check that the wiring is clamped firmly to provide enough clearance from the fan pulley, fan belt and other rotating or moving parts.
10. Check that the wiring has a little space so that it can vibrate between fixed and moving parts such as the vehicle body and the engine.



CHECKING FUSES

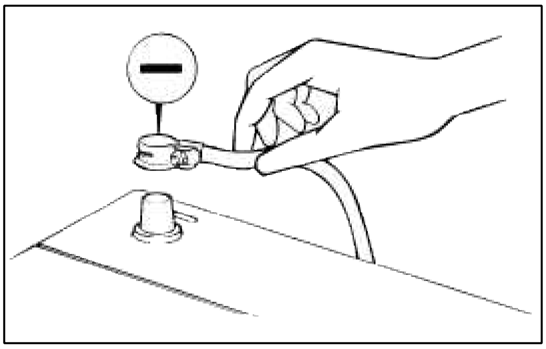
A blade type fuse has test taps provided to allow checking the fuse itself without removing it from the fuse block. The fuse is good if the test lamp lights up when one lead is connected to the test taps (one at a time) and the other lead is grounded. (Turn the ignition switch so that the fuse circuit becomes operative)



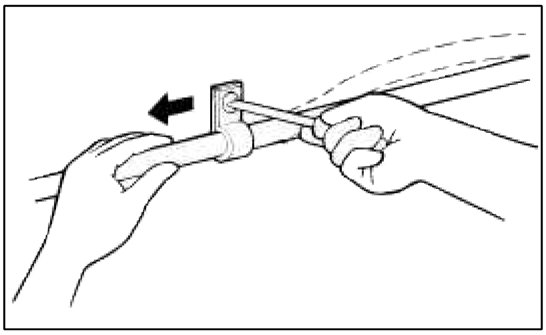
SERVICING THE ELECTRICAL SYSTEM

1. Prior to servicing the electrical system, be sure to turn off the ignition switch and disconnect the battery ground cable.

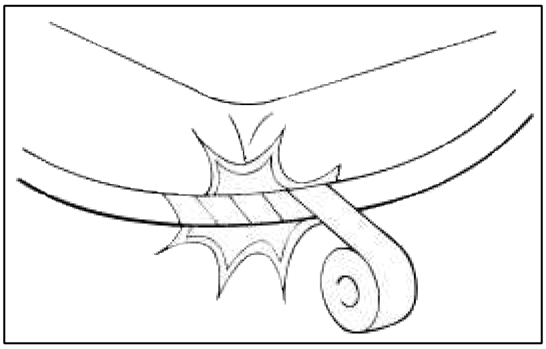
> **NOTE**
>
> In the course of MFI or ELC system diagnosis, when the battery cable is removed, any diagnostic trouble code retained by the computer will be cleared. There fore, if necessary, read the diagnostic codes before removing the battery cable.



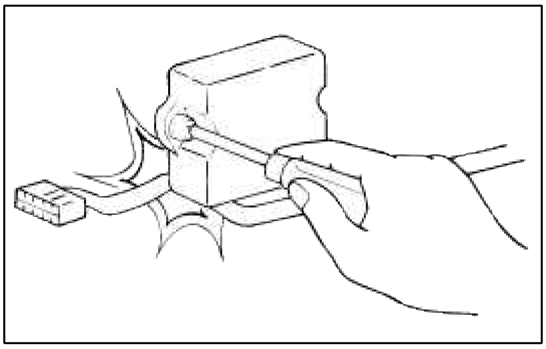
2. Attach the wiring harnesses with clamps so that there is no slack. However, for any harness which passes the engine or other vibrating parts of the vehicle, allow some slack within a range that does not allow the engine vibrations to cause the harness to come into contact with any of the surrounding parts, and then secure the harness by using a clamp.



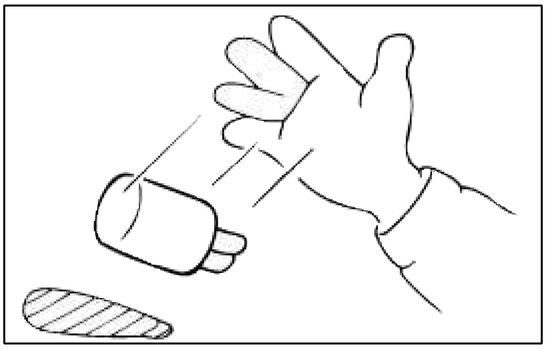
3. If any section of a wiring harness interferes with the edge of a part, or a corner, wrap the section of the harness with tape or something similar in order to protect it from damage.



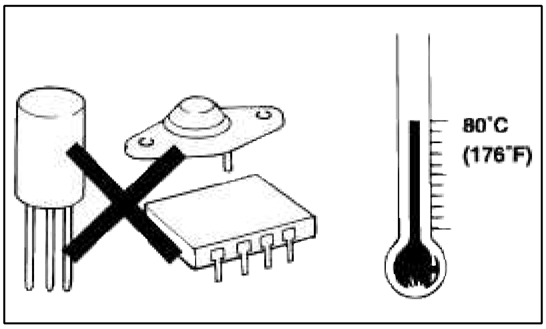
4. When installing any parts, be careful not to pinch or damage any of the wiring harnesses.



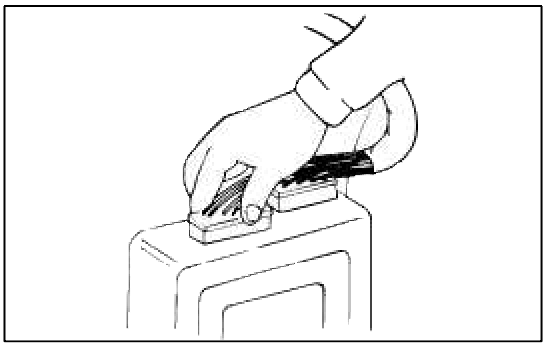
5. Never throw relays, sensors or electrical parts, or expose them to strong shock.



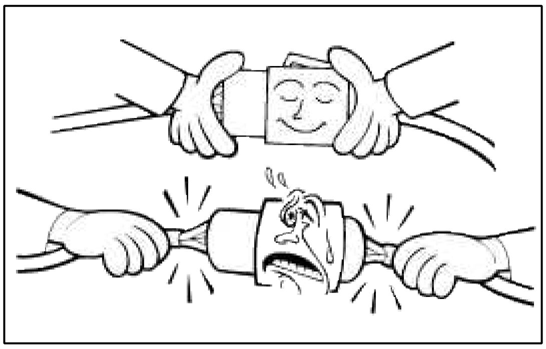
6. The electronic parts used in the computer, relays, etc. are readily damaged by heat. If there is a need for service operations that may cause the temperature to exceed 80°C (176°F), remove the electronic parts beforehand.



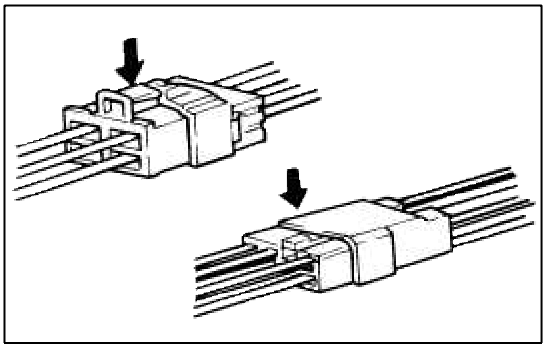
7. Loose connectors cause problems. Make sure that the connectors are always securely fastened.



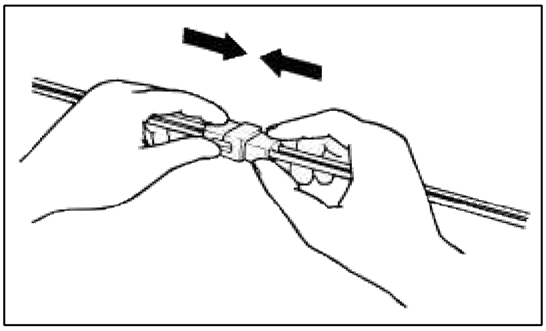
8. When disconnecting a connector, be sure to grip only the connector, not the wires.



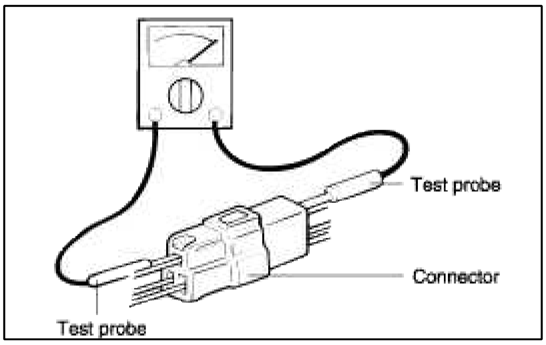
9. Disconnect connectors which have catches by pressing in the direction of the arrows shown the illustration.



10. Connect connectors which have catches by inserting the connectors until they make a clicking sound.



11. When using a circuit tester to check continuity or voltage on connector terminals, insert the test probe into the harness side. If the connecs a sealed connector, insert the test probe through the hole in the rubber cap until it contacts the terminal, being careful not to damage the insulation of the wires.



tomsn048@gmail.com

12. To avoid overloading the wiring, take the electrical current load of the optional equipment into consideration, and determine the appropriate wire size.

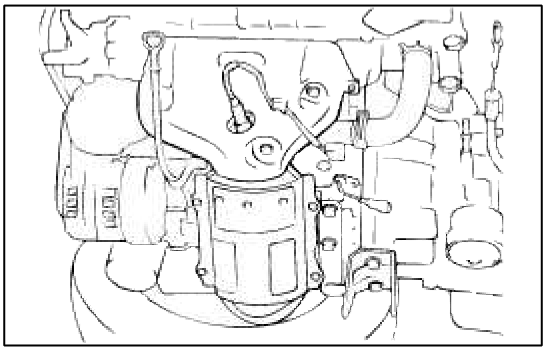
Norminal size	**SAE gauge No.**	**Permissible current**	
		In engine compartment	**Other areas**
0.3 mm^2	AWG 22	-	5A
0.5 mm^2	AWG 20	7A	13A
0.85 mm^2	AWG 18	9A	17A
1.25 mm^2	AWG 16	12A	22A
2.0 mm^2	AWG 14	16A	30A
3.0 mm^2	AWG 12	21A	40A
5.0 mm^2	AWG 10	31A	54A

PRECAUTIONS FOR CATALYTIC CONVERTER

CAUTION

If a large amount of unborned gasoline flow into the converter, it may overheat and create a fire hazard. To prevent this, observe the following precautions and explain them to your customer.

1. Use only unleaded gasoline.
2. Do not run the engine while the car is at rest for a long time. Avoid running the engie at fast idle for more than 10 minutes and at idle speed for more than 20 minutes.
3. Avoid start-jump tests. Do start-jumps only when absolutely necessary. Perform this test as rapidly as possible andm, while testing, never race the engine.
4. Do not measure engine compression for and extended time. Engine compression tests must be made as rapidly as possible.
5. Avoid coasting with the ignition turned off and during prolonged braking.
6. Do not dispose of a used catalytic converter together with parts contaminated with gasoline or oil.



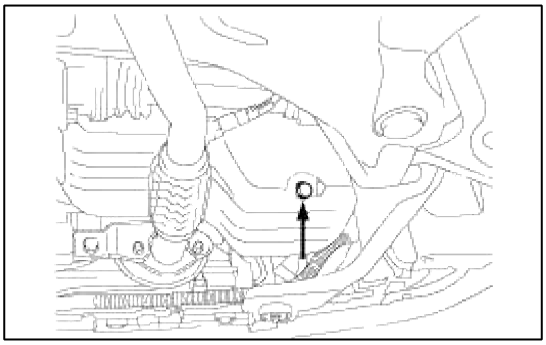
MAINTENANCE IMFORMATION

CHANGING ENGINE OIL

1. If the engine is cold, run the engine until it reaches normal operating temperature.
2. Turn off the engine.
3. Remove the oil filler cap and drain plug. Drain the engine oil.

4. Tighten the drain plug to the specified torque.

Tightening torque
Oil pan drain plug :
35 ~ 45 Nm (350 ~ 450 kg.cm, 25 ~ 33 lb.ft)



NOTE

Whenever tightening the oil drain plug, use a new drain plug gasket.

5. Fill new engine oil through the oil filler cap opening.

NOTE

Do not overfill, this will cause oil aeration and loss of oil pressure.

6. Install the oil filler cap.
7. Start and run the engine.
8. Turn off the engine and then check the oil level. Add oil if necessary.

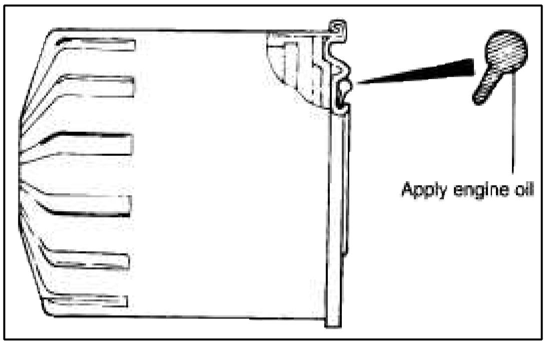
REPLACING THE ENGINE OIL FILTER

1. Use a filter wrench to remove the oil filter.
2. Before installing a new oil filter on the engine, apply clean engine oil to the surface of the rubber gasket.
3. Tighten the oil filter to the specified torque.

Tightening torque
Oil filter : 12 ~ 16 Nm (120 ~ 160 kg.cm, 9 ~ 12 lb.ft)

---

4. Start and run the engine and check for engine oil leaks.
5. After turning off the engine, check the oil level and add oil as necessary.



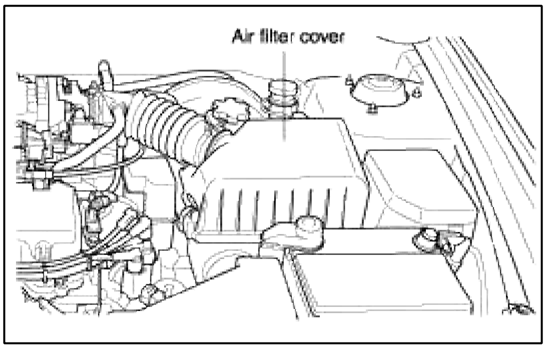
REPLACING THE AIR CLEANER FILTER

The air cleaner filter will become dirty during use and the filtering efficiency will be substantially reduced. Replace with a new one as needed.

1. Disconnect the clip holding air cleaner filter cover.
2. Remove the air filter cover.

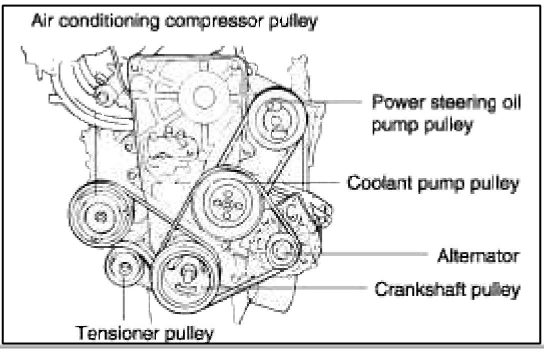
tomsn048@gmail.com

3. Remove the air cleaner filter.
4. Install a newair cleaner filter and replace the air cleaner filter cover.


Air filter cover

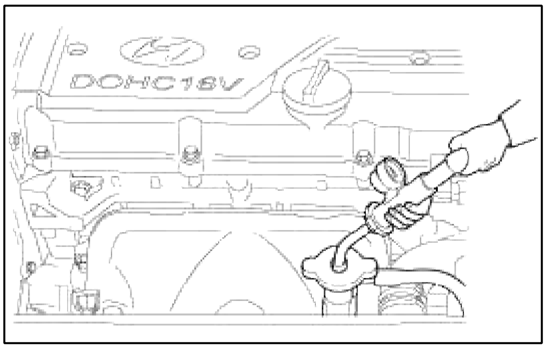
ADJUSTING BELT TENSION

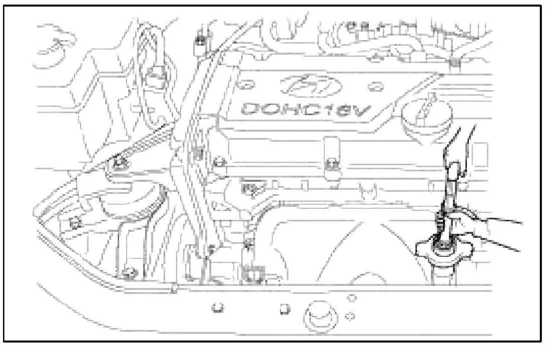
Refer to EM and EMA-Sections.


Air conditioning compressor pulley
Power steering oil pump pulley
Coolant pump pulley
Alternator
Crankshaft pulley
Tensioner pulley

CAUTION

If the concentration of the antifreeze is below 30%, the anticorrosion property will be adversely affected. In addition, if the concentration is above 60%, both the antifreeze and engine cooling properties will decrease, adversely affecting the engine. For these reasons be sure to maintain the concentration level within the specified range.





REPLACING THE COOLANT

1. Set the temperature control lever to the hot position.

2. Remove the radiator cap.

> **CAUTION**
>
> Remove the cap slowly. The system is pressurized and the coolant may be hot. Do not open the cap when the engine is hot.

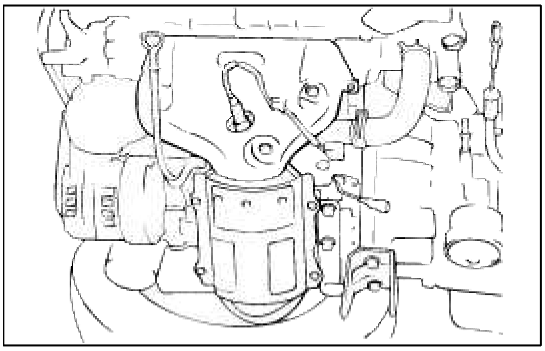
3. Loosen the drain plug to drain the coolant.
4. Drain the coolant from the reserve tank.
5. After draining the coolant, tighten the drain plug securely.
6. Fill the radiator with the coolant up to its filler neck.
7. Fill the reserve tank with coolant to the MAX. line.
8. Warm up the engine until the thermostat opens, remove the radiator cap and check the coolant level.
9. When the radiator is filled up to its filler neck, install the radiator cap securely.
10. Fill the reserve tank with coolant up to the "FULL" line.

REPLACING IGNITION CABLES

> **NOTE**
>
> When disconnecting an ignition cable, be sure to hold the cable cap. If the cable is disconnected by pulling on the cable alone, an open circuit might result.

REPLACING OXYGEN SENSOR

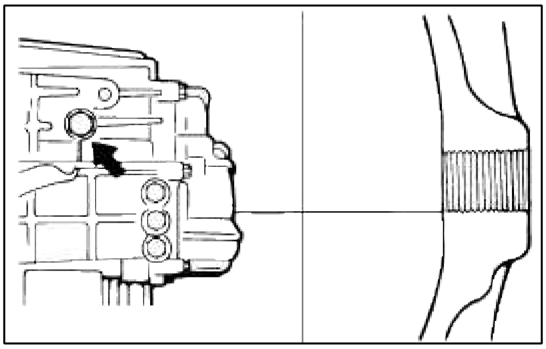
The oxygen sensor is a device which helps control the fuel mixture. If the oxygen sensor is damaged, the exhaust-gas cleaning efficiency as well as driveability deteriorate. Therfore, it should be replaced periodically with a new one.



MANUAL TRANSAXLE (INSPECT OIL LEVEL)

Inspect for leakage in each component and check the oil level by removing the filler plug. If the oil is contaminated, replace it with new oil.

1. With the vehicle parked on a level surface, remove the filler plug and make sure that the oil level is the same level as the plug hole.
2. Check that the transaxle oil is not dirty.



TRANSAXLE OIL (REPLACE)

1. With the vehicle parked on a level surface, remove the magnetic plug to drain transaxle oil.
2. Replace the washer with a new one and reinstall the magnet plug.
3. Fill with transaxle oil (through the filler plug part) until the oil level is the same level as the plug hole.

tomsn048@gmail.com

INSPECTING STEERING LINKAGE

1. Check the steering wheel freeplay.

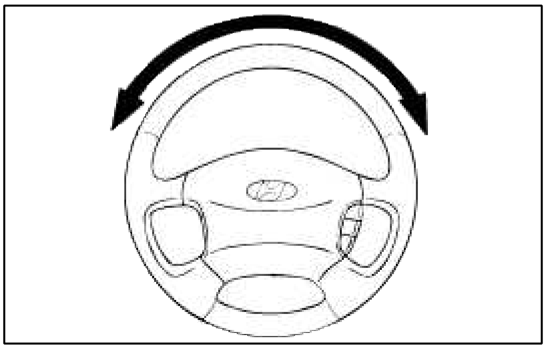
Maximum steering wheel freeplay : 30 mm (1.181 in.)

---

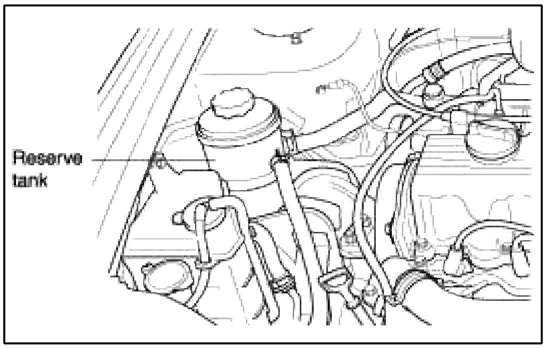
2. Check the steering linkage for looseness and damage.
   - A. Tie rod ends must not have excessive play.
   - B. Dust seals and boots must not be damaged.
   - C. Boot clamps must be not loose.

POWER STEERING FLUID LEVEL (INSPECT FLUID LEVEL)

1. Park the vehicle on a level surface, start the engine, and then turn the steering wheel several times to raise the temperature of the fluid to approximately 50°C (122°F).



2. With the engine idling, turn the wheel all the way to the left and right several times. Check the fluid in the oil reservoir for foaming, and its level. Replenish the fluid in the oil reservoir through the oil filter if necessary.



POWER STEERING HOSES (CHECK FOR DETERIORATION OR LEAKS)

1. Check the hose connections for fluid leaks.
2. The power steering hoses should be replaced if there is severe surface cracking, pulling, scuffing or worn steps. Deterioration of the hoses could cause premature failure.

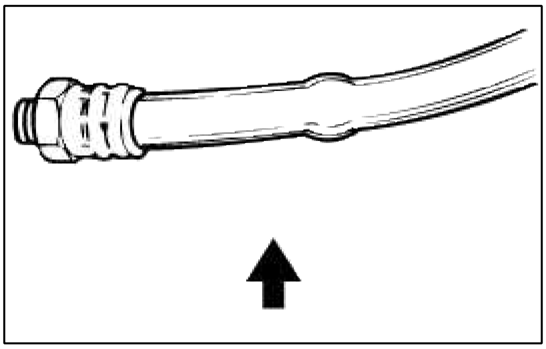
BALL JOINT AND STEERING LINKAGE SEALS, STEERING AND DRIVE SHAFT BOOTS

1. These components, which are permanently lubricated at the factory, do not require lubrication. Damaged seals and boots should be replaced to prevent leakage or contamination of the grease.
2. Inspect the dust covers and boots for proper sealing, leakage and damage. Replace them if defective.

INSPECTING BRAKE LINES

1. Check all brake lines and hoses for damage, wear, cracks, corrosion, leaks, bends, twists.
2. Check all clamps for tightness.

3. Check that the lines are clear of sharp edges, moving parts and the exhaust system.



FRONT DISC BRAKE PADS

Check for fluid contamination and wear. Always replace brake pads in complete sets.

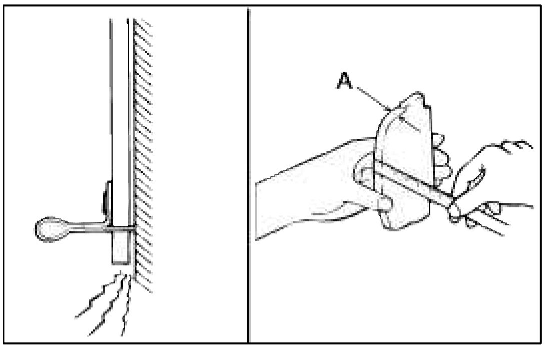
NOTE

If a squealing or scraping noise occurs from the brake during driving, check if the pad wear indicator is contacting the disc, if it is, the brake pad should be replaced.

CAUTION

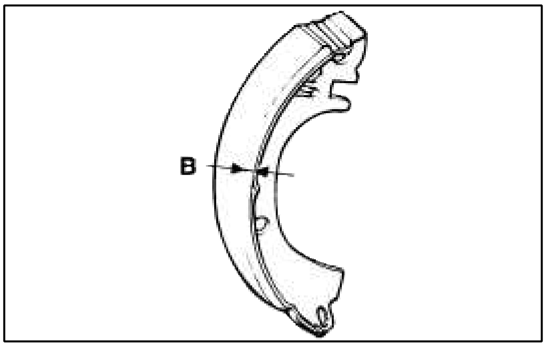
The pads for the right and left wheels should be replaced at the same time. Never split or intermix brake pad sets. All pads must be replaced as a complete set.

Thickness of pad lining [limit] : 2.0mm (0.079 in.)



REAR DRUM BRAKE LININGS AND REAR WHEEL CYLINDERS

1. Remove the brake drum and check the thickness of the brake shoe lining for wear. Check the automatic brake adjusting system by hand to see that it operates smoothly and gears are in proper mesh to each other.
   To assure smooth function, apply a very thin coat of grease to the friction surface of the adjuster and link shaft.
2. Inspect the wheel cylinder boots for fluid leaks. Visually check the boots for cuts, tears or heat cracks. (A small amount of fluid on the boot may not be a leak, but preservative fluid used at assembly.)

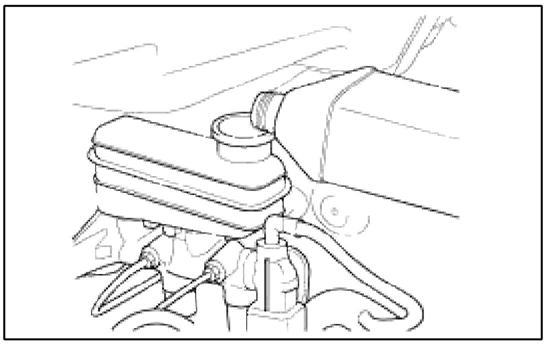


CHECKING THE BRAKE FLUID LEVEL

1. Check the level of the brake fluid in the reserve tank of the master cylinder.
2. The level should be between the "MAX" and "MIN" mark.

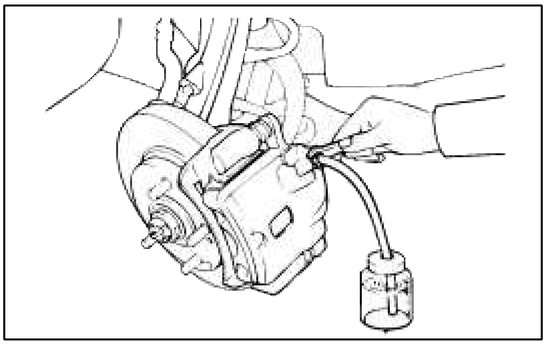
tomsn048@gmail.com

3. If the level is lower than the "MIN" mark, add fresh brake fluid up to the "MAX" mark.



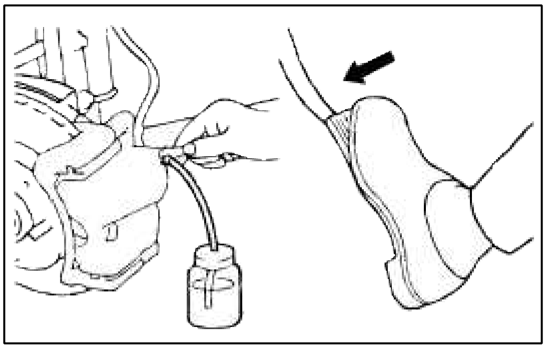
CHANGING BRAKE FLUID

1. Refer to BR Section for air-bleeding procedures.
2. Connect a vinyl tube to the bleeder screw of each wheel cylinder. Put the other end of the vinyl tube in a vessel for receiving the brake fluid.
3. With a vehicle equipped with ABS (Anti-lock Brake System), refer to the BR-section.



4. Depress the brake pedal a few times. Then loosen the bleeder screw (with the brake pedal still depressed), and tighten it after the brake fluid stops flowing.
5. Repeat the above operation until air bubbles are not in the brake fluid.
6. Repeat these steps for the other cylinders.
7. Add fresh brake fluid up to the "MAX" level in the reserve tank.

Brake fluid : DOT 3 or DOT 4



CHECKING TIRE INFLATION PRESSURE

TIRE INFLATION PRESSURE (CHECK WITH COOL TIRES)

Tire Size	Tirepressure
P 175/70 R13	30 PSI
185/60 HR14	30 PSI

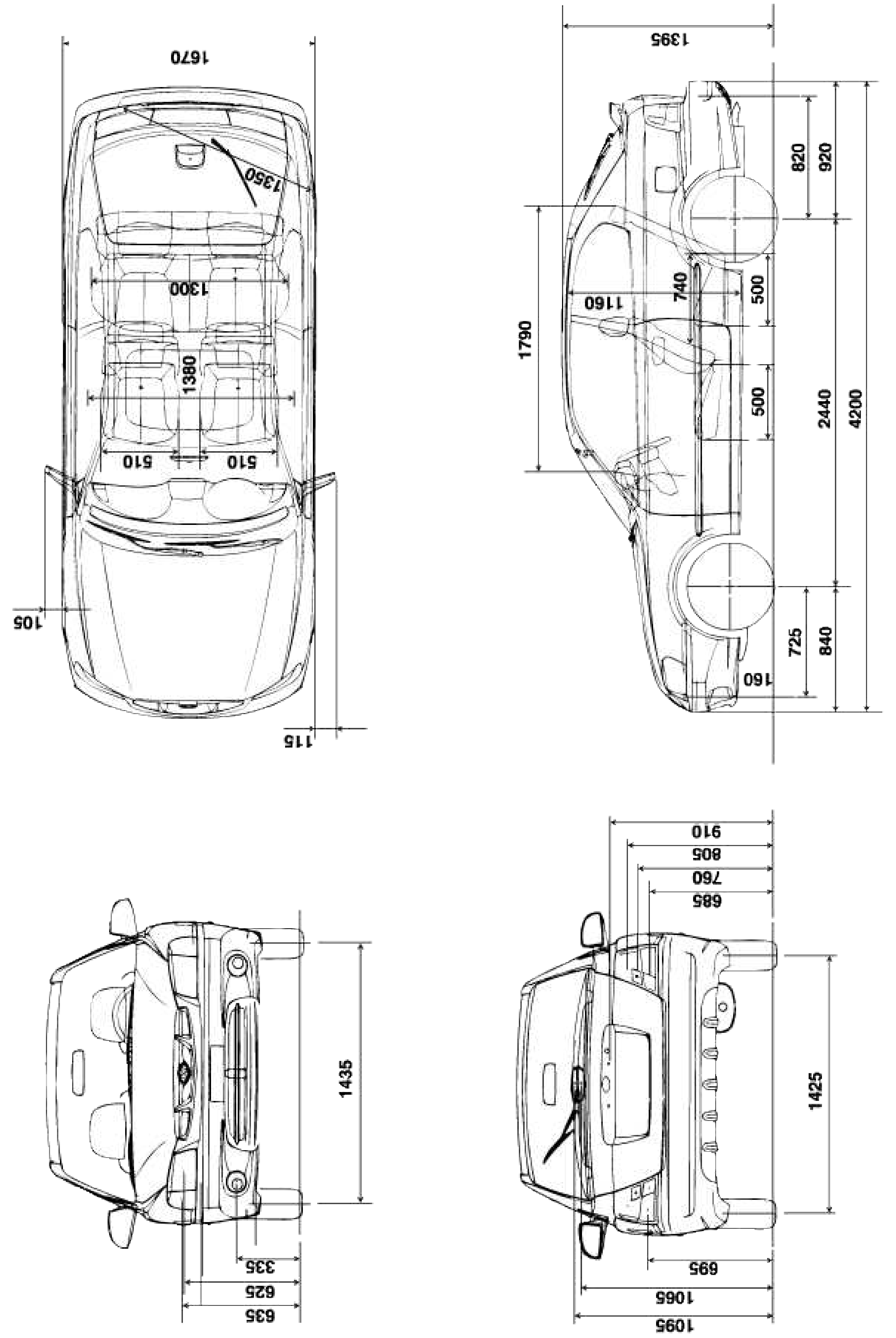
ROAD TEST

1. Check oil, fluid, fuel, water and exhaust gas leaks.
2. Check free play of clutch pedal and brake pedal.

3. Check the operation of brake booster.
4. Check the operation of service brake and parking brake systems.
5. Check the stroke of parking brake lever.
6. Check the driveability of engine.
7. Check the condition of instruments, gauges, indicators, exterior lamps, heater and ventilators.
8. Check for abnormal noises from each part.

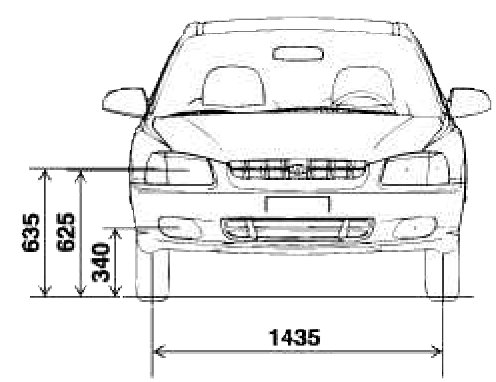
OVERALL BODY DIMENSION

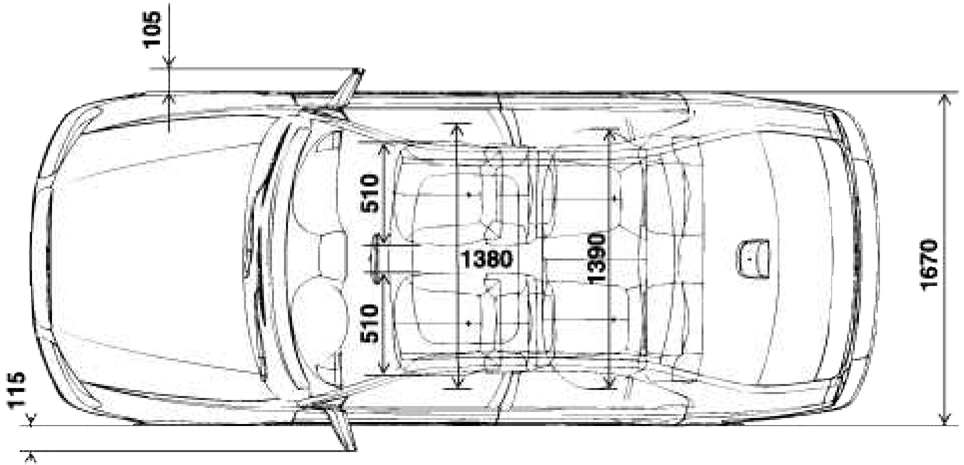
tomsn048@gmail.com

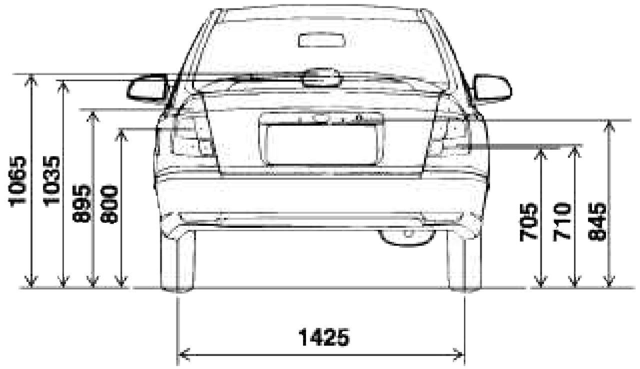

1670
1790

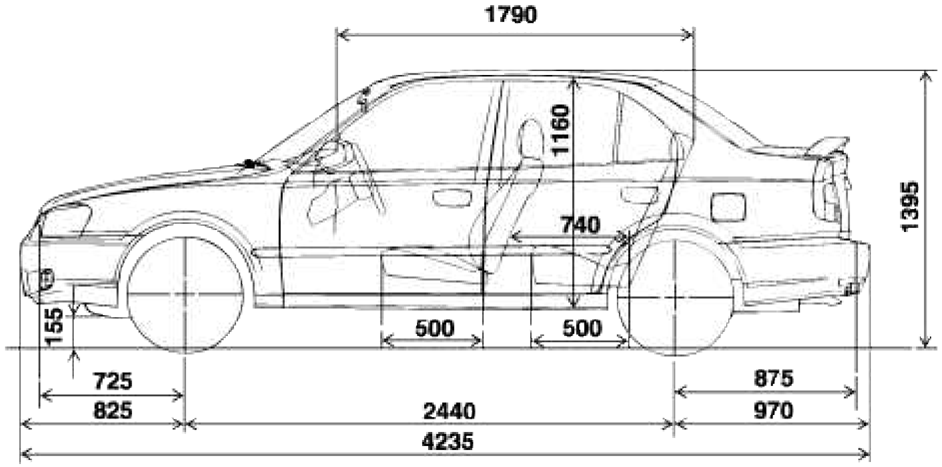
3 - DOOR

4 - DOOR


635
625
340
1435


105
510
1380
1390
510
1670
115


1065
1035
895
800
705
710
845
1425

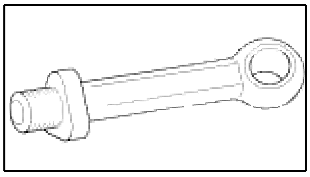
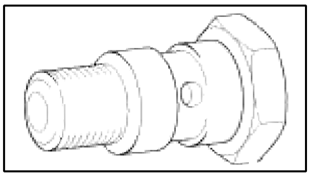
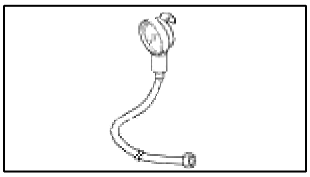
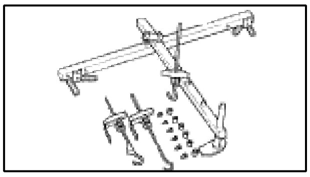
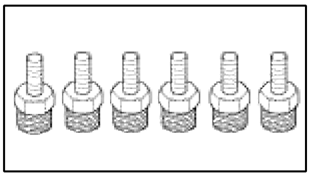

1790
1160
740
1395
155
500
500
725
825
2440
875
970
4235

tomsn048@gmail.com

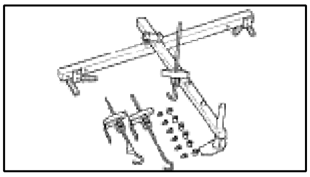
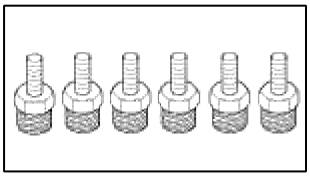
ACCENT(LC) > 2002 > G 1.5 SOHC > Automatic Transaxle System

Automatic Transaxle System > General Information > Special Service Tools

SPECIAL TOOLS (A/T)

Tool (Number and Name)	Illustration	Use
09452-21001 Oil pressure gauge adapter		Measurement of the oil pressure (Use with 092452-21002, 09452-21500)
09452-21002 Oil pressure gauge adapter		Measurement of the oil pressure (Use with 09452-21500 and 09452-21001)
09452-21500 Oil pressure gauge		Measurement of the oil pressure (Use with 09452-21001 and 09452-21002)
J28467-B Engine support fixtrue		Removal and installation of transaxle assembly
J28467-125 Engine support adapters		Use with J28467-B

SPECIAL TOOLS (M/T)

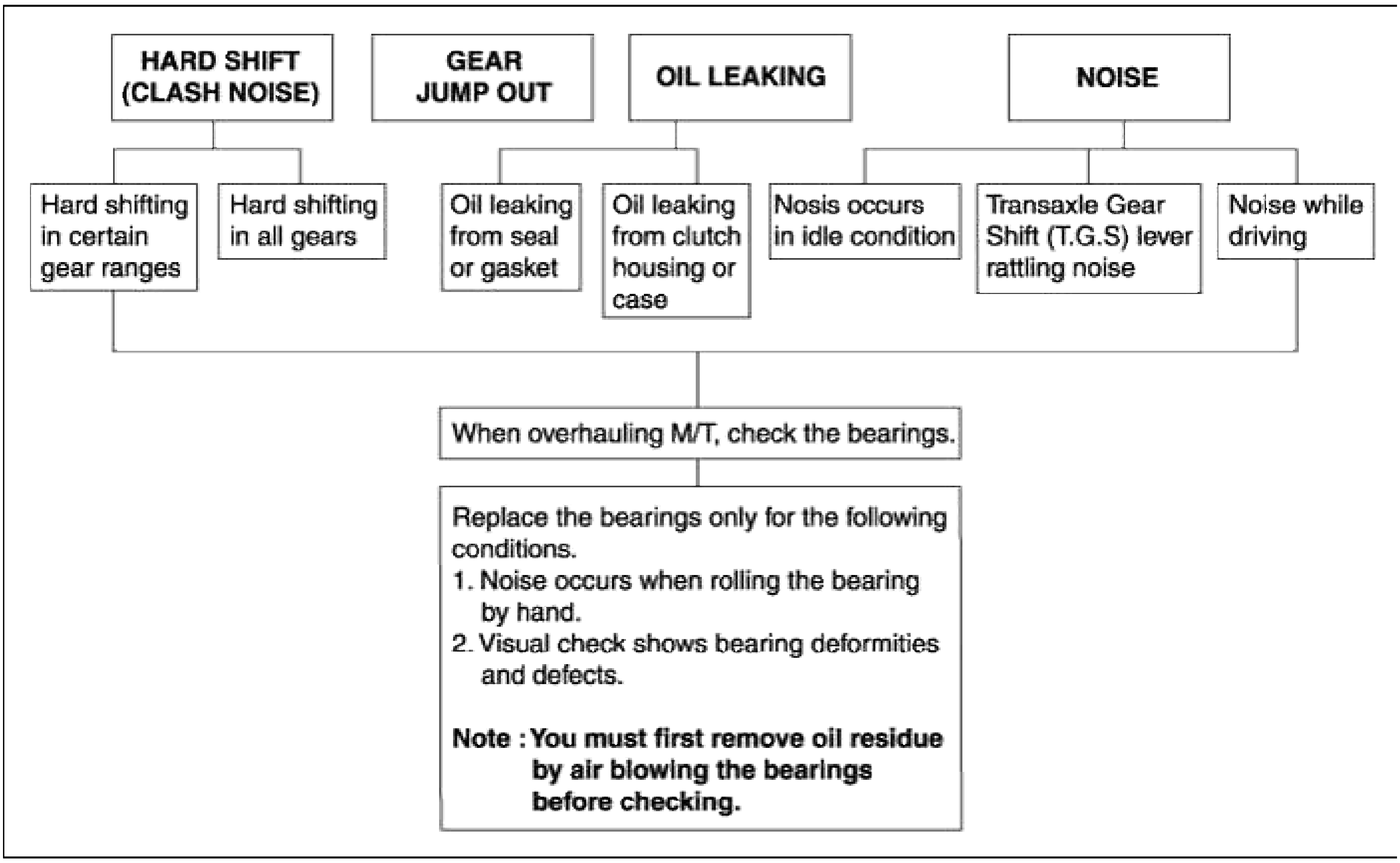
Tool (Number and Name)	Illustration	Use
J28467-B Engine support fixture		Removal and installation of transaxle assembly
J28467-125 Engine support adapters		Use with J28467-B

Automatic Transaxle System > General Information > Troubleshooting

TROUBLESHOOTING (M/T)

Symptom	Probable cause	Remedy
Vibration, noise	Loose or damaged transaxle and engine mounts	Tighten or replace mounts
	Inadequate shaft end play	Correct end play
	Worn or damaged gears	Replace gears
	Inadequate grade of oil	Replace with specified oil
	Low oil level	Replenish
	Inadequate engine idle speed	Adjust idle speed
Oil leakage	Broken or damaged, oil seal or O-ring	Replace control cable
Hard shift	Faulty control cable	Replace control cable
	Poor contact or wear of synchronizer ring and gear cone	Correct or replace
	Weakened synchronizer spring	Replace synchronizer spring
	Inadequate grade of oil	Replace with specified oil
Jumps out of gear	Worn gear shift fork or broken poppet spring	Replace shift fork or poppet spring
	Synchronizer hub-to-sleeve spline clearance too large	Replace synchronizer hub and sleeve

PROBLEM CHART (M/T)


HARD SHIFT (CLASH NOISE)
GEAR JUMP OUT
OIL LEAKING
NOISE
Hard shifting in certain gear ranges
Hard shifting in all gears
Oil leaking from seal or gasket
Oil leaking from clutch housing or case
Nosis occurs in idle condition
Transaxle Gear Shift (T.G.S) lever rattling noise
Noise while driving

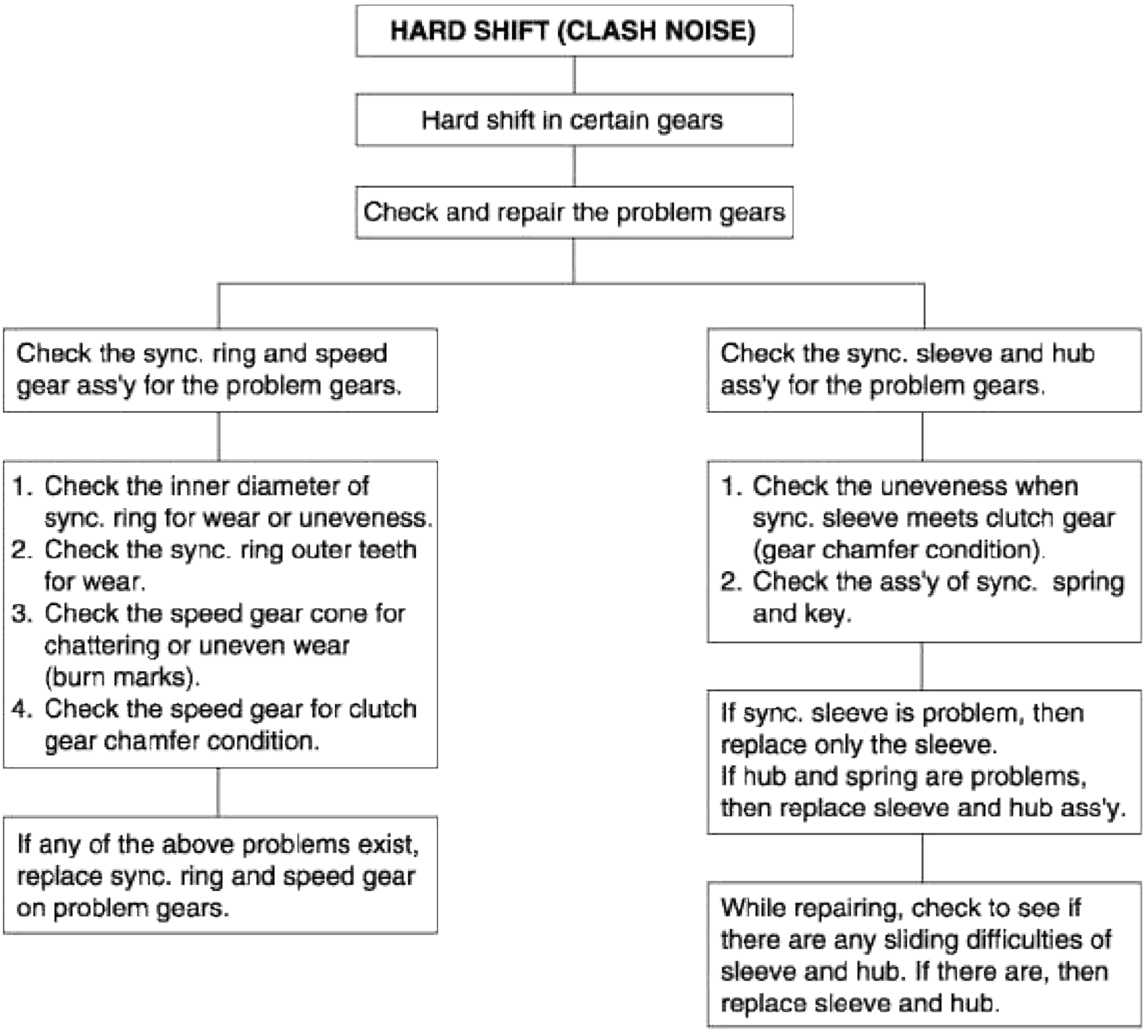
When overhauling M/T, check the bearings.

Replace the bearings only for the following conditions.

1. Noise occurs when rolling the bearing by hand.
2. Visual check shows bearing deformities and defects.

Note : You must first remove oil residue by air blowing the bearings before checking.

tomsn048@gmail.com



HARD SHIFT (CLASH NOISE)

Hard shift in certain gears

Check and repair the problem gears

Check the sync. ring and speed gear ass'y for the problem gears.

1. Check the inner diameter of sync. ring for wear or uneveness.
2. Check the sync. ring outer teeth for wear.
3. Check the speed gear cone for chattering or uneven wear (burn marks).
4. Check the speed gear for clutch gear chamfer condition.

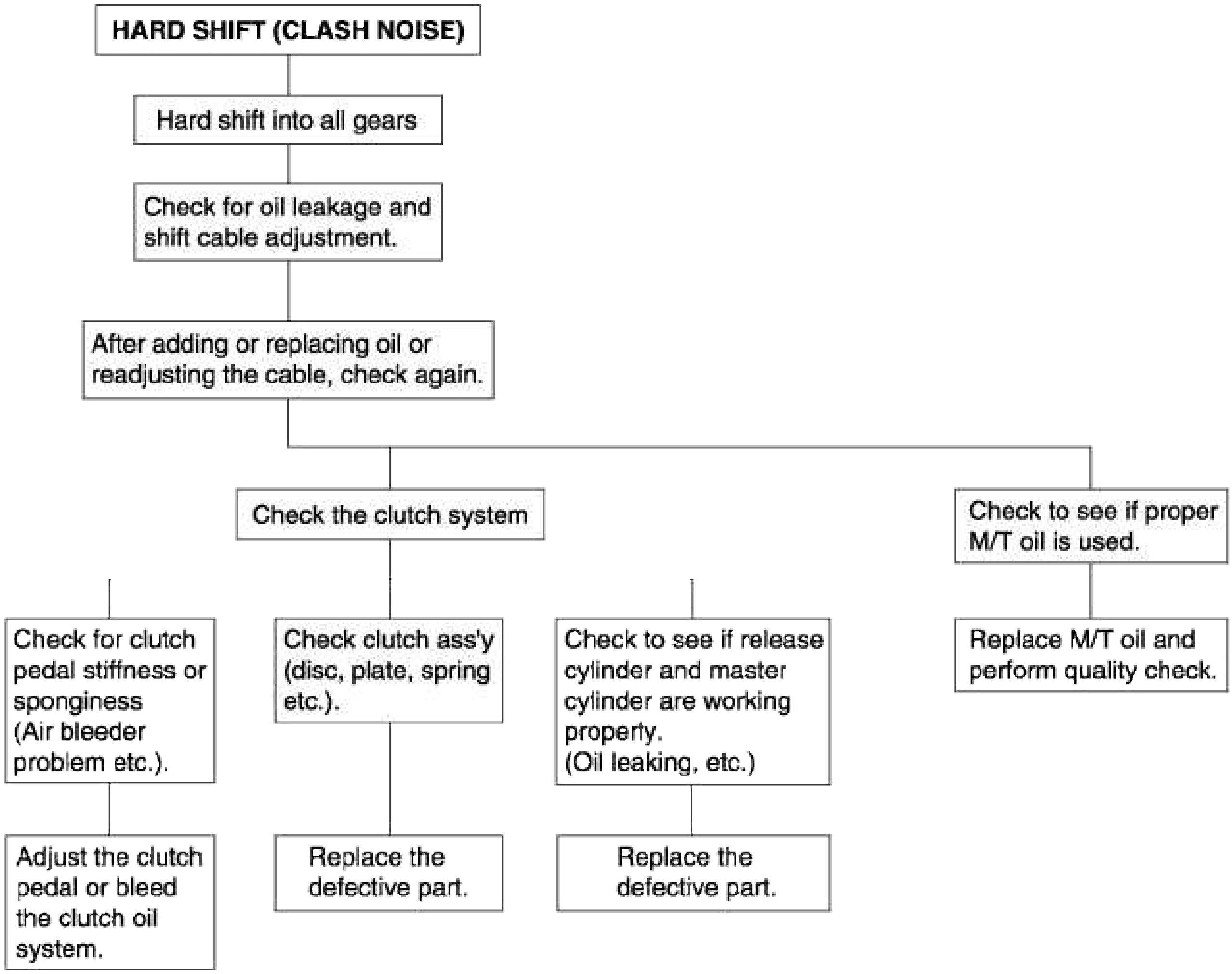
If any of the above problems exist, replace sync. ring and speed gear on problem gears.

Check the sync. sleeve and hub ass'y for the problem gears.

1. Check the uneveness when sync. sleeve meets clutch gear (gear chamfer condition).
2. Check the ass'y of sync. spring and key.

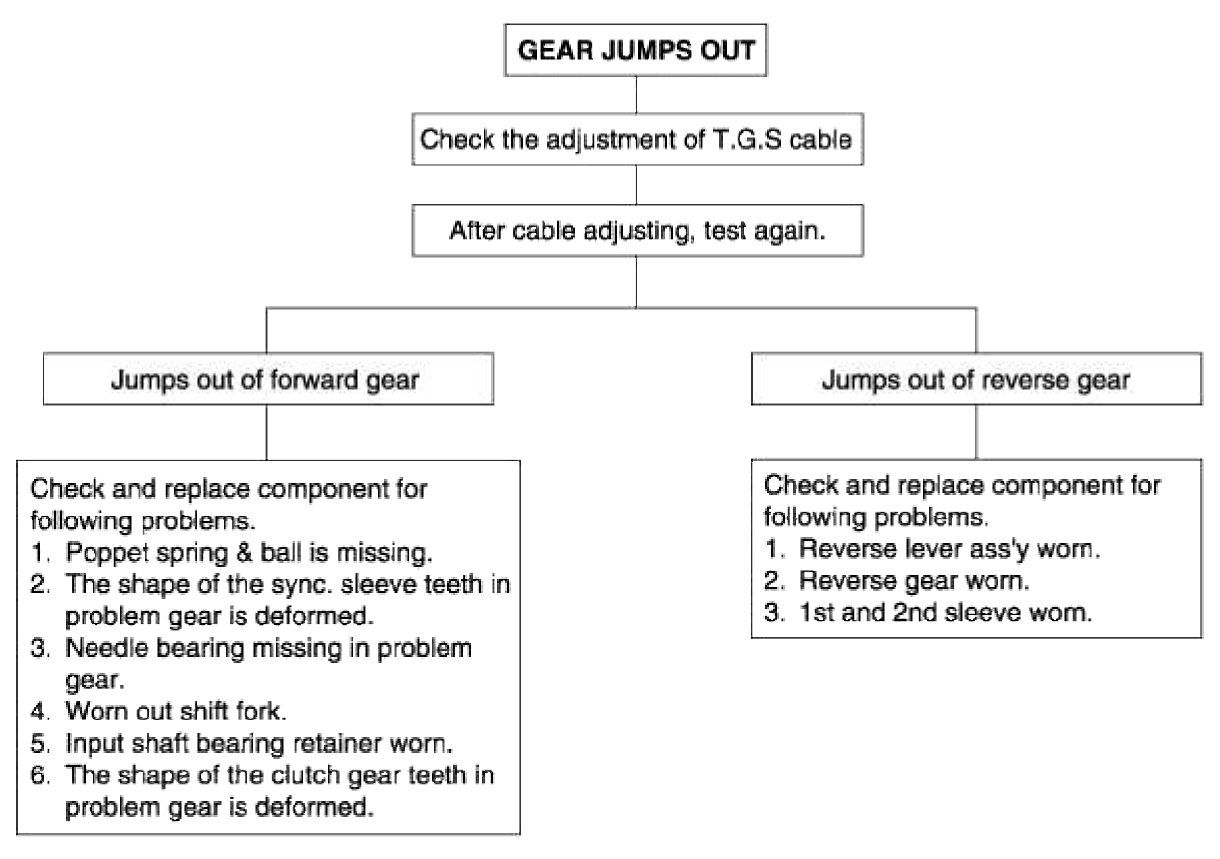
If sync. sleeve is problem, then replace only the sleeve.
If hub and spring are problems, then replace sleeve and hub ass'y.

While repairing, check to see if there are any sliding difficulties of sleeve and hub. If there are, then replace sleeve and hub.


HARD SHIFT (CLASH NOISE)
Hard shift into all gears
Check for oil leakage and shift cable adjustment.
After adding or replacing oil or readjusting the cable, check again.
Check the clutch system
Check to see if proper M/T oil is used.
Check for clutch pedal stiffness or sponginess (Air bleeder problem etc.).
Check clutch ass'y (disc, plate, spring etc.).
Check to see if release cylinder and master cylinder are working properly. (Oil leaking, etc.)
Replace M/T oil and perform quality check.
Adjust the clutch pedal or bleed the clutch oil system.
Replace the defective part.
Replace the defective part.

Before performing any work, check the driving habits of customers :
If shifting occurs as the clutch is being pressed, then hard shifting would occur in all gears.

tomsn048@gmail.com



GEAR JUMPS OUT

Check the adjustment of T.G.S cable

After cable adjusting, test again.

Jumps out of forward gear

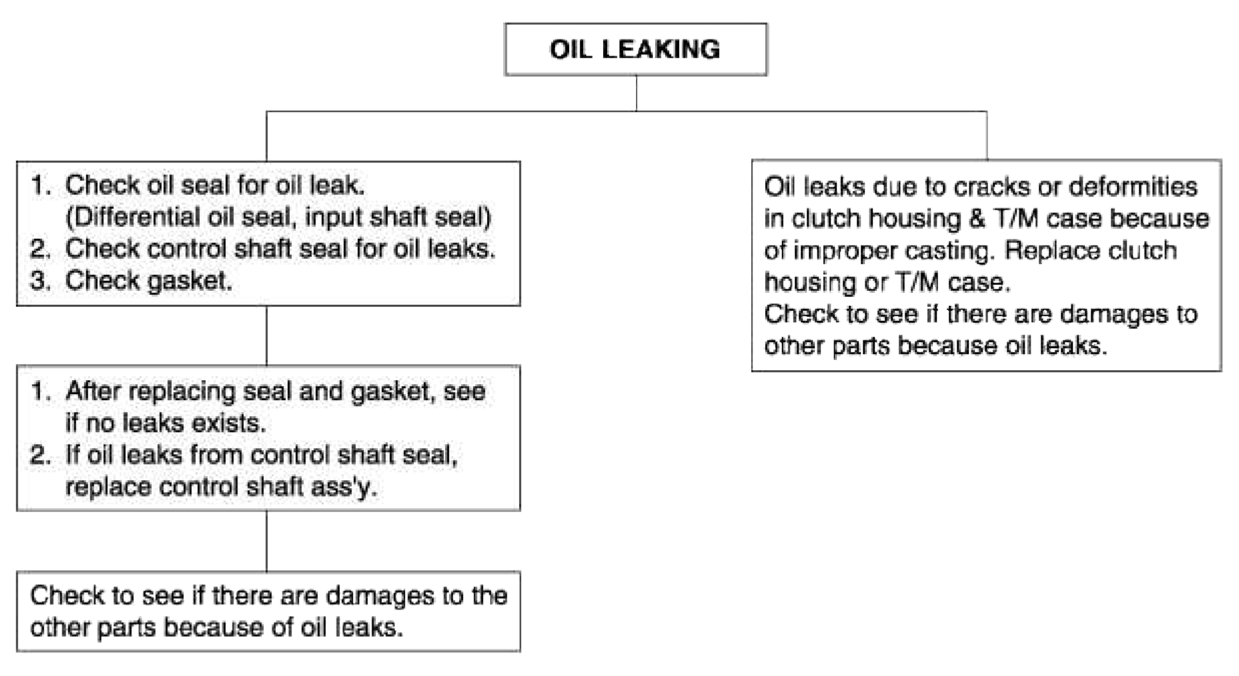
Check and replace component for following problems.

1. Poppet spring & ball is missing.
2. The shape of the sync. sleeve teeth in problem gear is deformed.
3. Needle bearing missing in problem gear.
4. Worn out shift fork.
5. Input shaft bearing retainer worn.
6. The shape of the clutch gear teeth in problem gear is deformed.

Jumps out of reverse gear

Check and replace component for following problems.

1. Reverse lever ass'y worn.
2. Reverse gear worn.
3. 1st and 2nd sleeve worn.



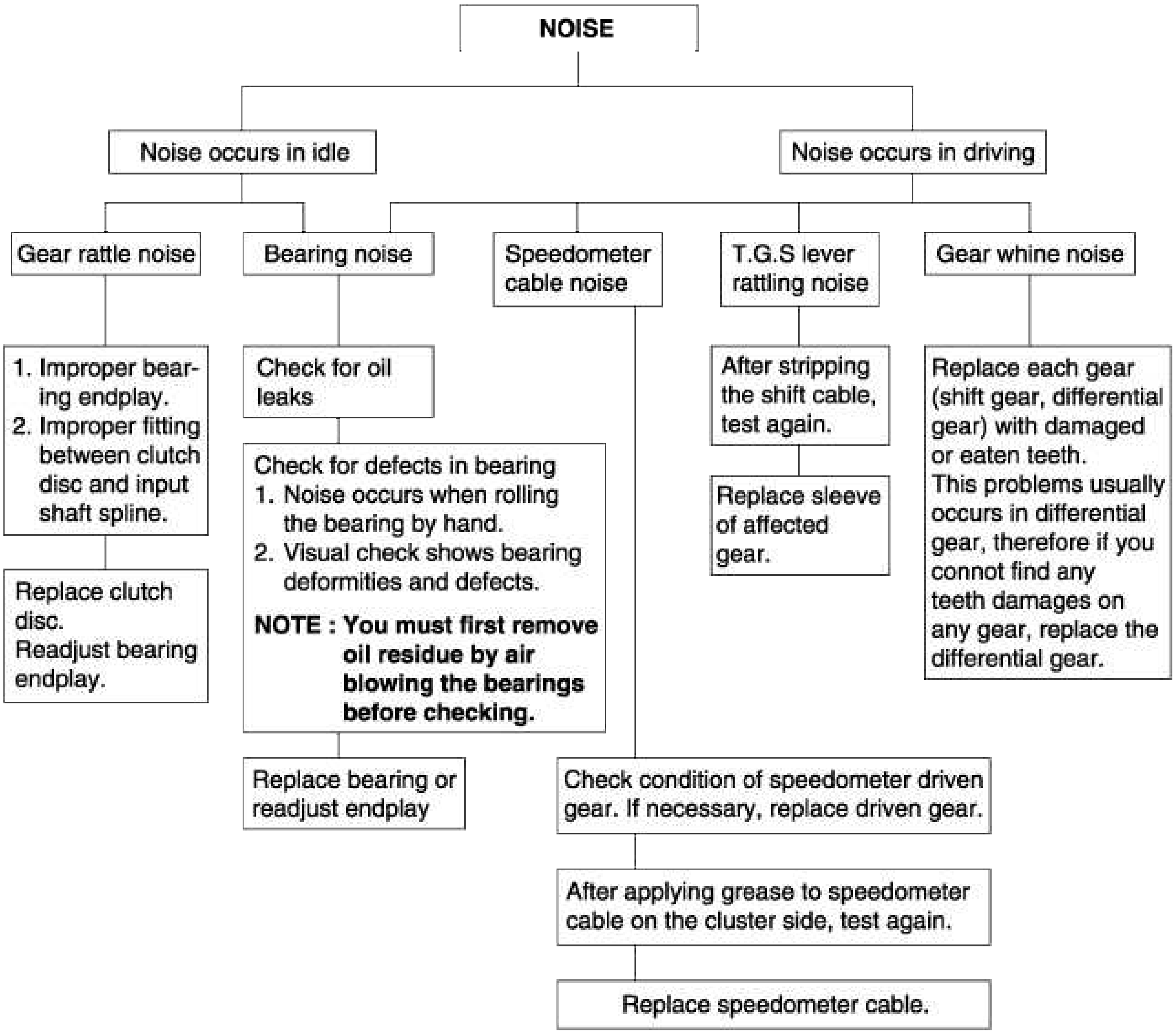
OIL LEAKING

1. Check oil seal for oil leak. (Differential oil seal, input shaft seal)
2. Check control shaft seal for oil leaks.
3. Check gasket.

1. After replacing seal and gasket, see if no leaks exists.
2. If oil leaks from control shaft seal, replace control shaft ass'y.

Check to see if there are damages to the other parts because of oil leaks.

Oil leaks due to cracks or deformities in clutch housing & T/M case because of improper casting. Replace clutch housing or T/M case.
Check to see if there are damages to other parts because oil leaks.


NOISE
Noise occurs in idle
Noise occurs in driving
Gear rattle noise
Bearing noise
Speedometer cable noise
T.G.S lever rattling noise
Gear whine noise
1. Improper bearing endplay.
2. Improper fitting between clutch disc and input shaft spline.
Replace clutch disc. Readjust bearing endplay.
Check for oil leaks
Check for defects in bearing
1. Noise occurs when rolling the bearing by hand.
2. Visual check shows bearing deformities and defects.
NOTE : You must first remove oil residue by air blowing the bearings before checking.
Replace bearing or readjust endplay
After stripping the shift cable, test again.
Replace sleeve of affected gear.
Replace each gear (shift gear, differential gear) with damaged or eaten teeth. This problems usually occurs in differential gear, therefore if you connot find any teeth damages on any gear, replace the differential gear.
Check condition of speedometer driven gear. If necessary, replace driven gear.
After applying grease to speedometer cable on the cluster side, test again.
Replace speedometer cable.

Automatic Transaxle System > General Information > Specifications

SPECIFICATIONS (A/T)

tomsn048@gmail.com

Item		A4AF3	
Torque converter type		D3-element, 1-stage, 2-phase type	
Transaxle type		D4-speed forward, 1-speed reverse	
Engine displacement		1.5SOHC	1.6DOHC
Gear ratio	1st	2.846	←
	2nd	1.581	←
	3rd	1.000	←
	4th	0.685	←
Reverse		2.176	←
Final gear ratio		3.656	4.041
End play (mm)	Front clutch snap ring	0.5±0.1	
	Rear clutch snap ring	0.8±0.1	
	End clutch snap ring	0.5±0.1	
	Low and reverse brake snap ring	0.675~0.987	

TIGHTENING TORUQE (A/T)

Item	N·m	kg·cm	lb·ft
Shift lever mounting bolt	12-15	120-150	8-11
Starter motor mounting bolt	27-34	270-340	19-25
Shift lever cam rod nut	14-20	140-200	10-14
Knob and lever assembly	More than 2	More than 20	More than 1.4
Bell housing cover to engine	8-10	80-100	6-7
Transaxle mounting bracket to body frame	30-40	300-400	21-28
Transaxle mounting insulator bolt	90-110	900-1100	63-77
Front roll stopper to subframe	30-40	300-400	21-28
Front roll stopper insulator bolt	45-60	450-600	33-44
Rear roll stopper to subframe bolt	30-40	300-400	21-28
Rear roll stopper insulator bolt	45-60	450-600	33-44
Kick down servo lock nut	15-22	150-220	11-16
Lever indicator panel	More than 15	More than 150	More than 11
Oil drain plug, filler plug	30-35	300-350	22-25
Transaxle range switch	10-12	100-120	7-9

LUBRICANT

Items	Specified lubricant	Quantity
Transaxle fluid Lit. (U.S. qts., lmp.qts.)	GENUINE HYUNDAI ATF SP-III	6.1 (6.3, 5.3)
Drive shaft oil seal lip	Automatic transaxle fluid	As required
Sliding part of bushing	Chassis grease SAE J310, NLGI No.0	As required
Selector lever sliding portion	Multipurpose grease SAE J310, NLGI No.2	As required

SPECIFICATIONS (M/T)

Model		M5AF3	
Type		Forward 5 speed, reverse 1 speed	
Engine displacement		1.5SOHC	1.6DOHC
Gear ratio	First	3.615	3.615
	Second	2.053	2.053
	Third	1.370	1.370
	Fourth	0.971	1.031
	Fifth	0.825	0.825
	Reverse	3.250	3.250
Final gear ratio		3.650	3.842
Transaxle fluid		HYUNDAI GENUINE PARTS MTF 75W/90	
Capacity (Lit., u.s.qts, Imp.qts)		2.15 (2.27, 1.89)	

SERVICE SPECIFICATIONS (M/T)

Item	End play
Input shaft rear bearing end play	0.01L - 0.09L
Output shaft bearing end play	0.05T - 0.10T
Differential bearing end play	0.15T - 0.20T
Differential pinion end play	0.025L - 0.15L
Input shaft front bearing end play	0.01L - 0.12L

TIGHTENING TORQUE (M/T)

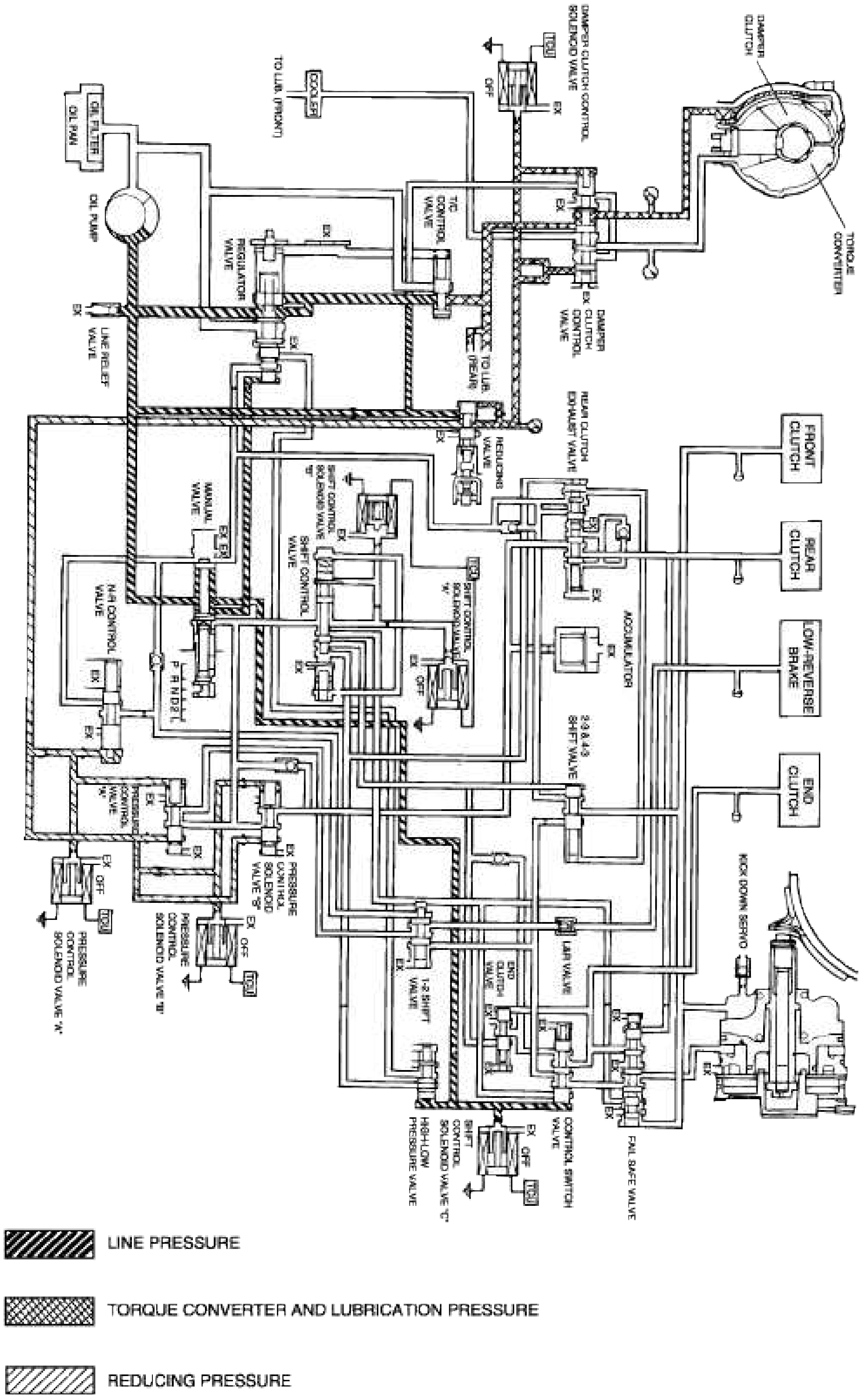
tomsn048@gmail.com

Item	N·m	Kg·cm	lb·ft
Shift lever mounting bolt	9-14	90-140	6-10
Clutch release cylinder	15-22	150-220	11-16
Control cable bracket	12-15	120-150	8-11
Front roll stopper to sub frame	30-40	300-400	21-28
Front roll stopper insulator bolt	45-60	450-600	33-44
Rear roll stopper to subframe bolt	30-40	300-400	21-28
Rear roll stopper insulator bolt	45-60	450-600	33-44
Transaxle mounting bracket to body frame	30-40	300-400	21-28
Transaxle mounting insulator bolt	90-110	900-1100	63-77

Automatic Transaxle System > Automatic Transaxle System > Flow Diagram

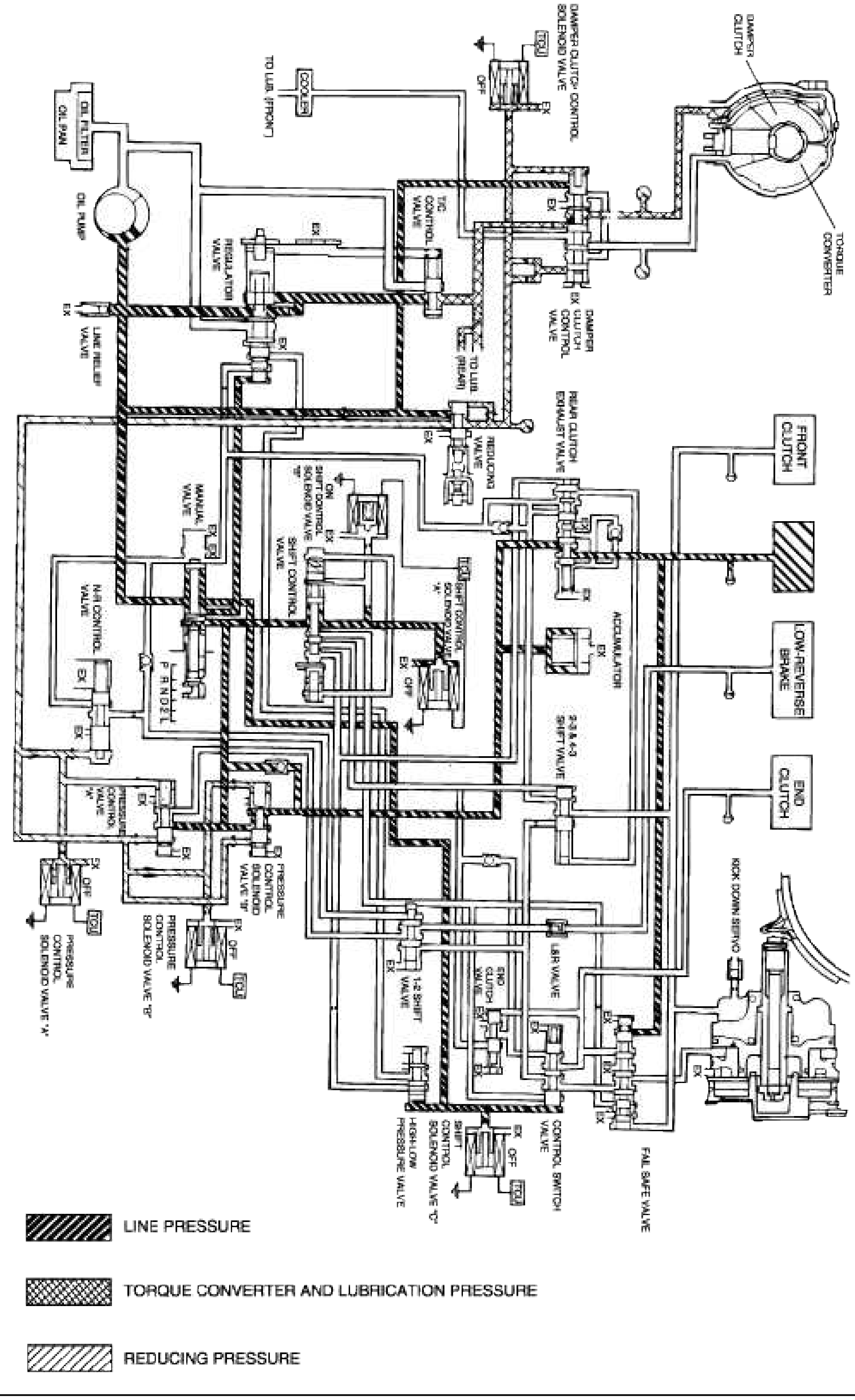
AUTOMATIC TRANSAXLE HYDRAULIC CIRCUIT

NEUTRAL & PARK

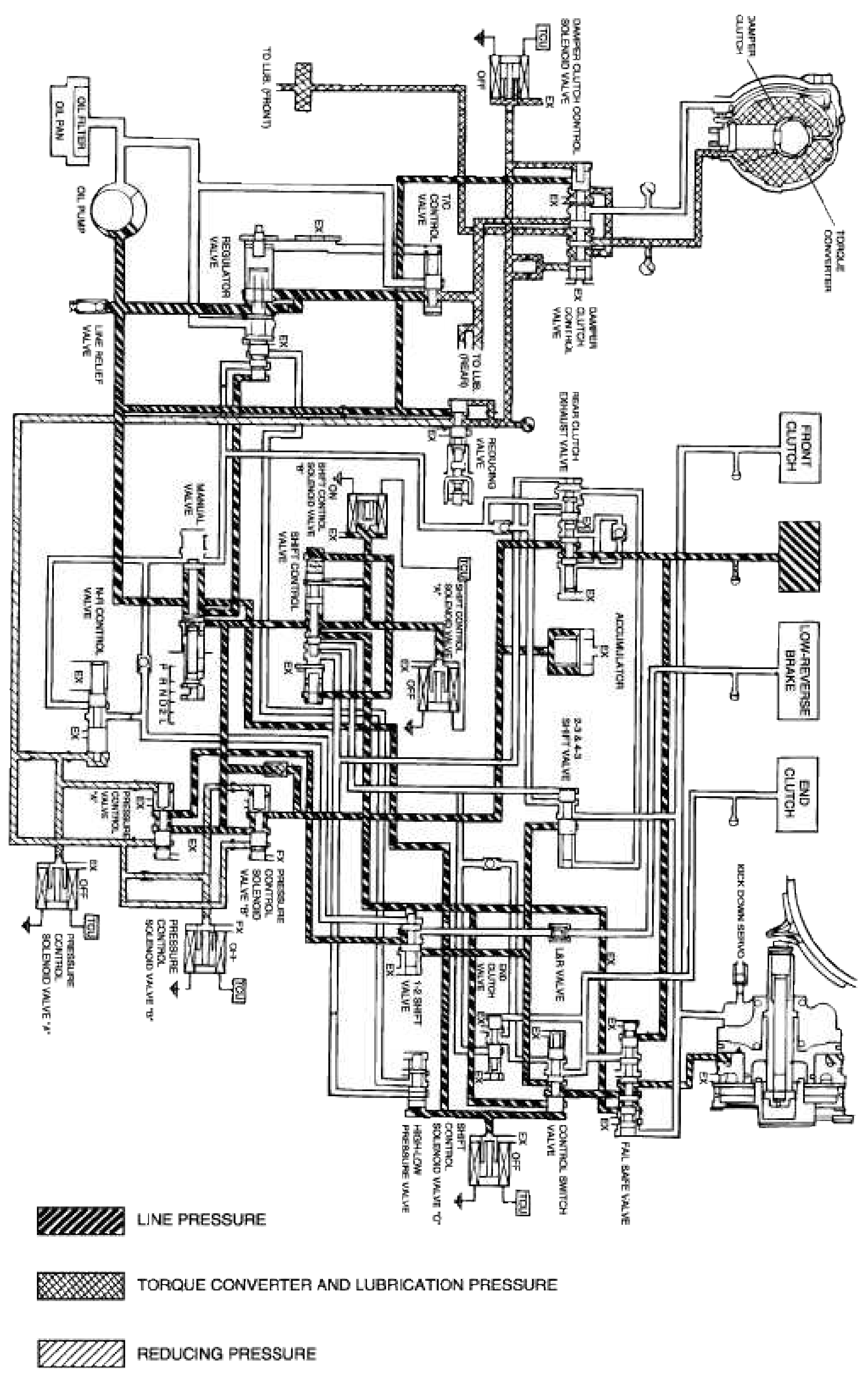

DAMPER CLUTCH
TORQUE CONVERTER
DAMPER CLUTCH CONTROL SOLENOID VALVE
TCU
EX
OFF
COOLER
TO LUB. (FRONT)
OIL FILTER
OIL PAN
OIL PUMP
T/C CONTROL VALVE
REGULATOR VALVE
DAMPER CLUTCH CONTROL VALVE
LINE RELIEF VALVE
TO LUB. (REAR)
REAR CLUTCH EXHAUST VALVE
REDUCING VALVE
FRONT CLUTCH
REAR CLUTCH
LOW-REVERSE BRAKE
END CLUTCH
ACCUMULATOR
2-3 & 4-3 SHIFT VALVE
MANUAL VALVE
SHIFT CONTROL SOLENOID VALVE "B"
SHIFT CONTROL VALVE
SHIFT CONTROL SOLENOID VALVE "A"
N-R CONTROL VALVE
P R N D 2 L
PRESSURE CONTROL VALVE "A"
PRESSURE CONTROL VALVE "B"
PRESSURE CONTROL SOLENOID VALVE "B"
PRESSURE CONTROL SOLENOID VALVE "A"
KICK DOWN SERVO
L-R VALVE
END CLUTCH VALVE
1-2 SHIFT VALVE
FAIL SAFE VALVE
CONTROL SWITCH VALVE
SHIFT CONTROL SOLENOID VALVE "C"
HIGH-LOW PRESSURE VALVE
LINE PRESSURE
TORQUE CONVERTER AND LUBRICATION PRESSURE
REDUCING PRESSURE

DRIVE (FIRST)

tomsn048@gmail.com

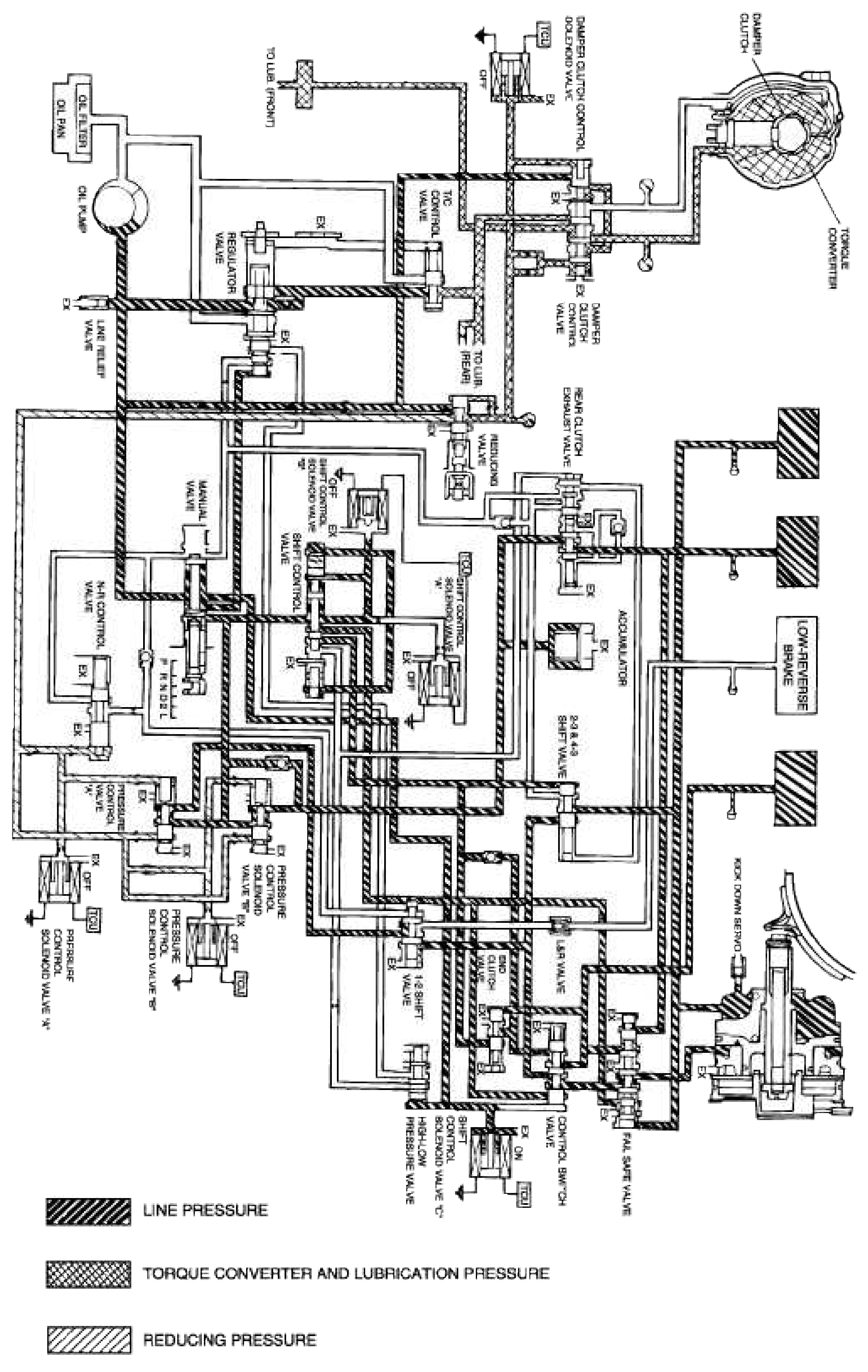

TORQUE CONVERTER
DAMPER CLUTCH
DAMPER CLUTCH CONTROL SOLENOID VALVE
TCU
OFF
EX
COOLER
TO LUB. (FRONT)
OIL FILTER
OIL PAN
OIL PUMP
T/C CONTROL VALVE
REGULATOR VALVE
DAMPER CLUTCH CONTROL VALVE
TO LUB. (REAR)
LINE RELIEF VALVE
REAR CLUTCH EXHAUST VALVE
REDUCING VALVE
FRONT CLUTCH
SHIFT CONTROL SOLENOID VALVE "B"
ON
SHIFT CONTROL VALVE
MANUAL VALVE
SHIFT CONTROL SOLENOID VALVE "A"
N-R CONTROL VALVE
P R N D 2 L
ACCUMULATOR
LOW-REVERSE BRAKE
2-3 & 4-3 SHIFT VALVE
END CLUTCH
PRESSURE CONTROL VALVE "A"
PRESSURE CONTROL SOLENOID VALVE "B"
PRESSURE CONTROL SOLENOID VALVE "A"
KICK DOWN SERVO
L-R VALVE
END CLUTCH VALVE
1-2 SHIFT VALVE
FAIL SAFE VALVE
CONTROL SWITCH VALVE
SHIFT CONTROL SOLENOID VALVE "C"
HIGH-LOW PRESSURE VALVE
LINE PRESSURE
TORQUE CONVERTER AND LUBRICATION PRESSURE
REDUCING PRESSURE

DRIVE (SECOND)

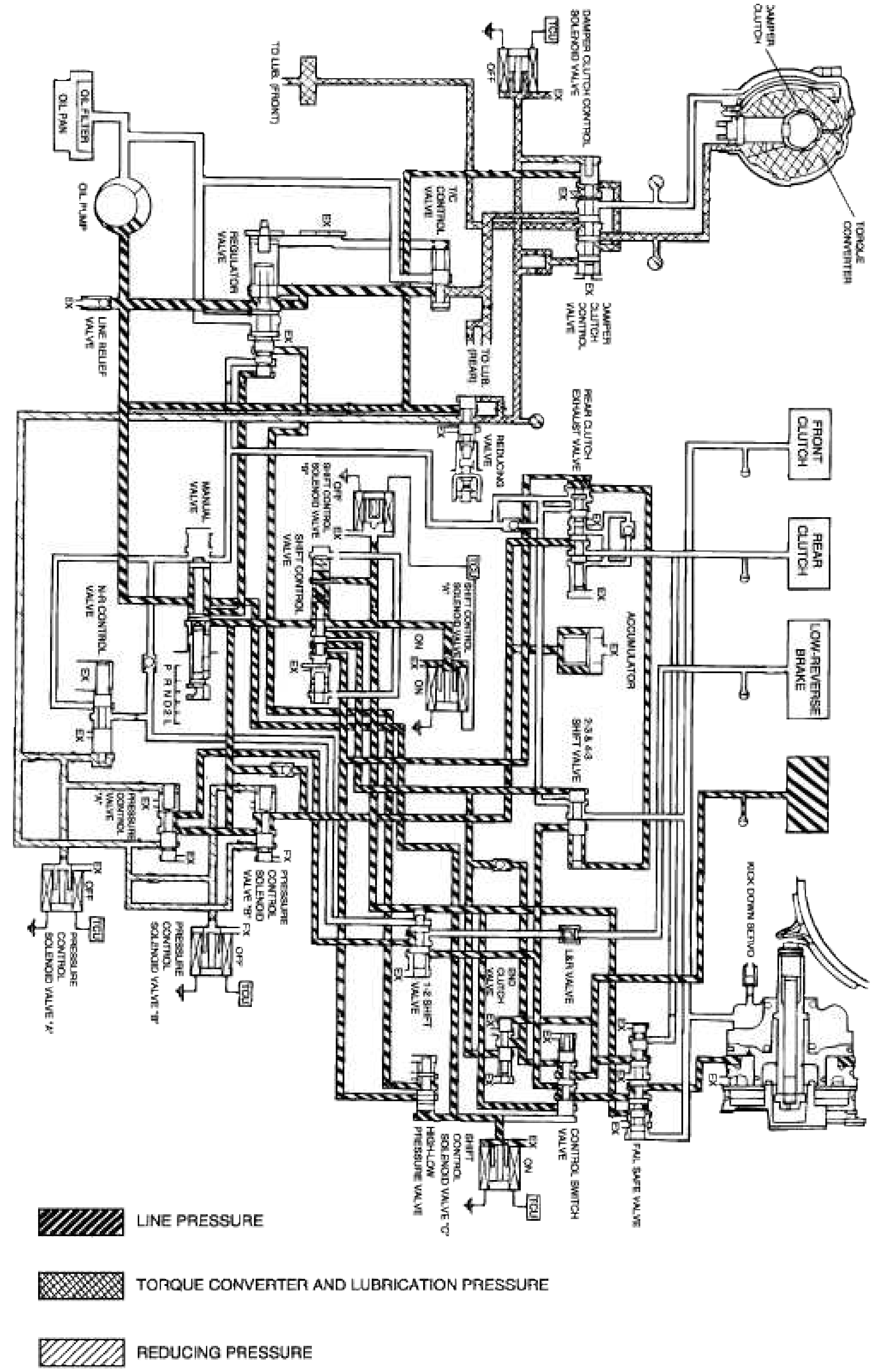

TORQUE CONVERTER
DAMPER CLUTCH
DAMPER CLUTCH CONTROL SOLENOID VALVE
TCU
OFF
EX
TO LUB. (FRONT)
OIL FILTER
OIL PAN
OIL PUMP
T/C CONTROL VALVE
REGULATOR VALVE
DAMPER CLUTCH CONTROL VALVE
TO LUB. (REAR)
LINE RELIEF VALVE
REDUCING VALVE
REAR CLUTCH EXHAUST VALVE
FRONT CLUTCH
MANUAL VALVE
SHIFT CONTROL SOLENOID VALVE "B"
ON
SHIFT CONTROL VALVE
SHIFT CONTROL SOLENOID VALVE "A"
ACCUMULATOR
LOW-REVERSE BRAKE
N-R CONTROL VALVE
P R N D 2 L
2-3 & 4-3 SHIFT VALVE
END CLUTCH
PRESSURE CONTROL VALVE "A"
PRESSURE CONTROL VALVE "B"
PRESSURE CONTROL SOLENOID VALVE "B"
PRESSURE CONTROL SOLENOID VALVE "A"
KICK DOWN SERVO
L&R VALVE
END CLUTCH VALVE
1-2 SHIFT VALVE
FAIL SAFE VALVE
CONTROL SWITCH VALVE
SHIFT CONTROL SOLENOID VALVE "C"
HIGH-LOW PRESSURE VALVE
LINE PRESSURE
TORQUE CONVERTER AND LUBRICATION PRESSURE
REDUCING PRESSURE

DRIVE (THIRD)

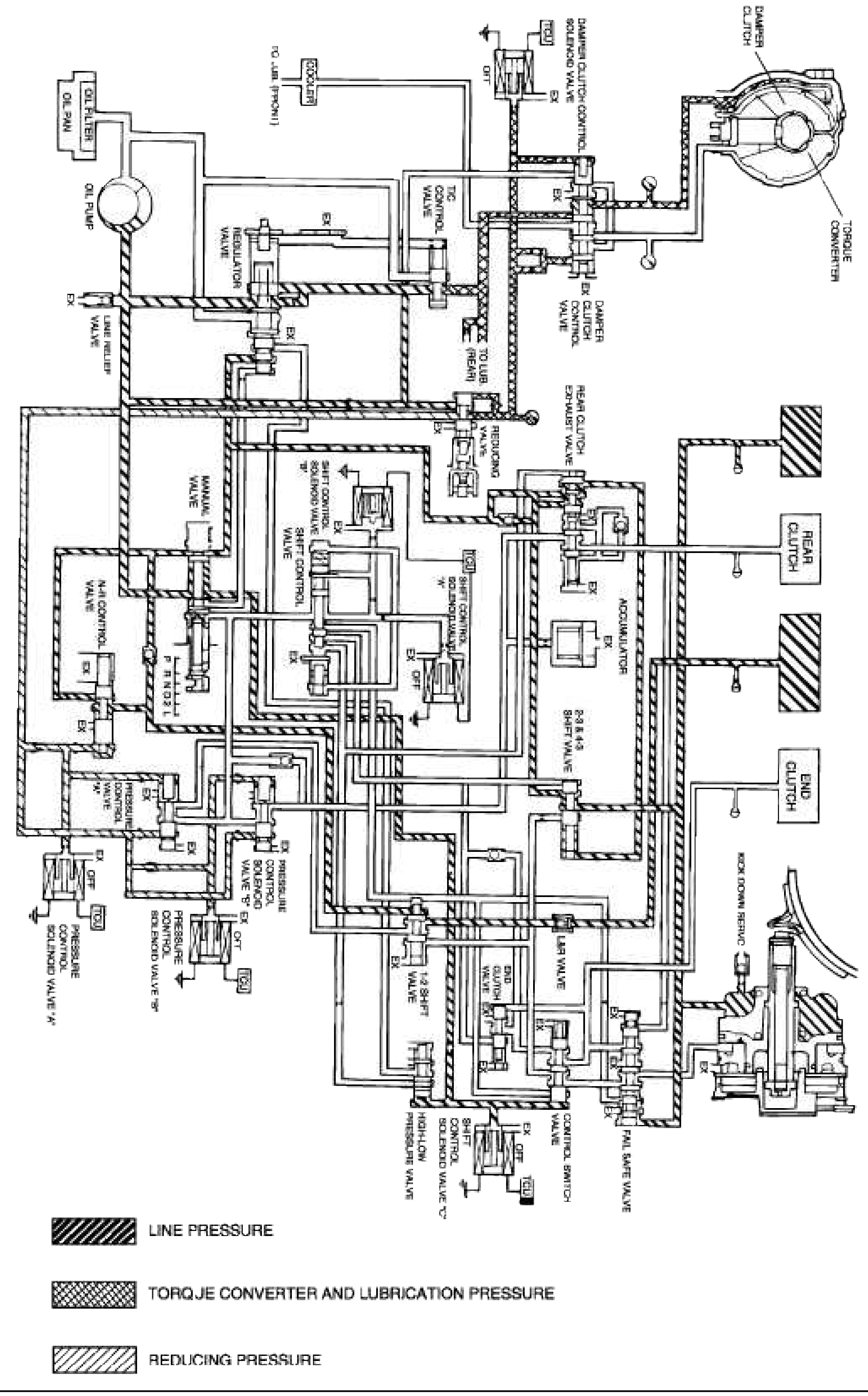
tomsn048@gmail.com


TORQUE CONVERTER
DAMPER CLUTCH
DAMPER CLUTCH CONTROL SOLENOID VALVE
TCU
OFF
EX
TO LUB. (FRONT)
OIL FILTER
OIL PAN
OIL PUMP
LINE RELIEF VALVE
REGULATOR VALVE
T/C CONTROL VALVE
DAMPER CLUTCH CONTROL VALVE
TO LUB. (REAR)
REDUCING VALVE
REAR CLUTCH EXHAUST VALVE
MANUAL VALVE
SHIFT CONTROL SOLENOID VALVE "B"
SHIFT CONTROL VALVE
SHIFT CONTROL SOLENOID VALVE "A"
N-R CONTROL VALVE
P R N D 2 L
ACCUMULATOR
LOW-REVERSE BRAKE
2-3 & 4-3 SHIFT VALVE
PRESSURE CONTROL VALVE "A"
PRESSURE CONTROL SOLENOID VALVE "B"
PRESSURE CONTROL SOLENOID VALVE "A"
KICK DOWN SERVO
L&R VALVE
END CLUTCH VALVE
1-2 SHIFT VALVE
CONTROL SWITCH VALVE
FAIL SAFE VALVE
SHIFT CONTROL SOLENOID VALVE "C"
HIGH-LOW PRESSURE VALVE
ON
LINE PRESSURE
TORQUE CONVERTER AND LUBRICATION PRESSURE
REDUCING PRESSURE

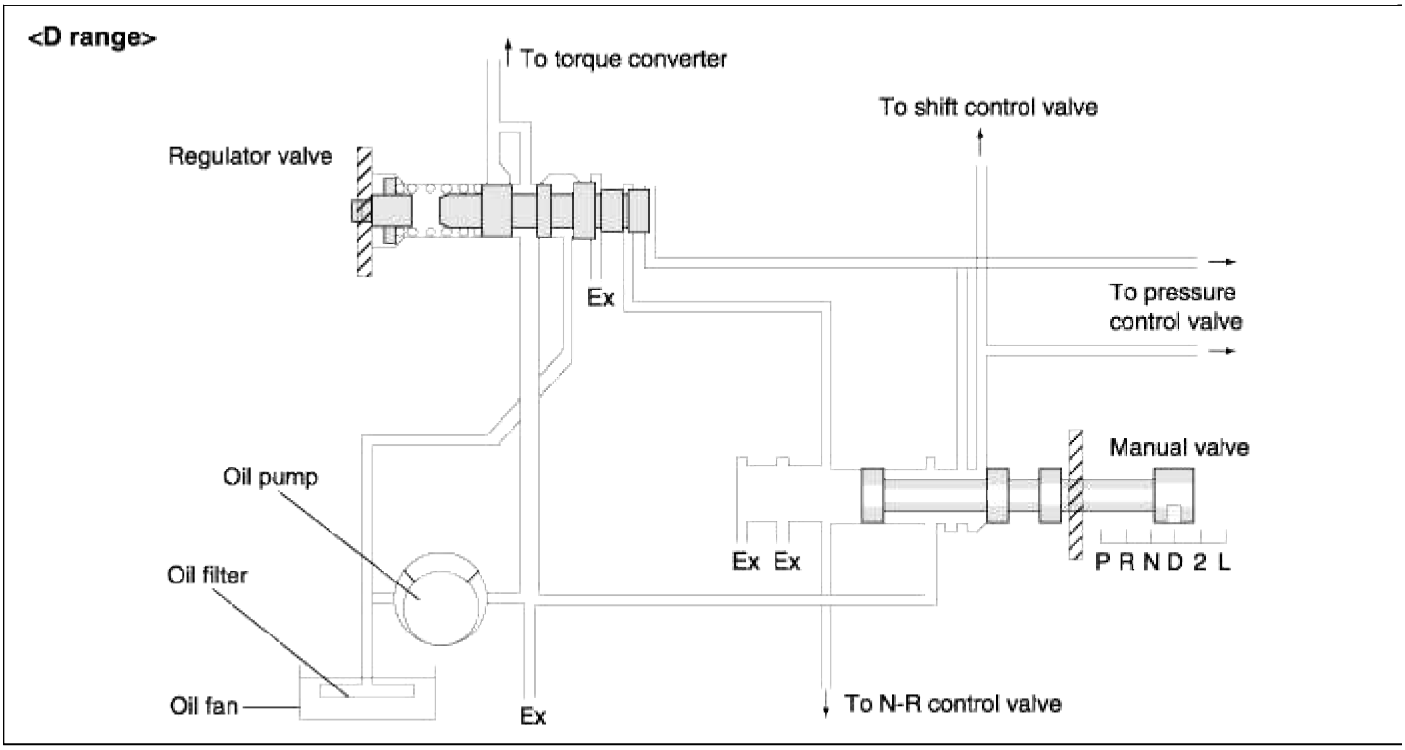
DRIVE (FOURTH)

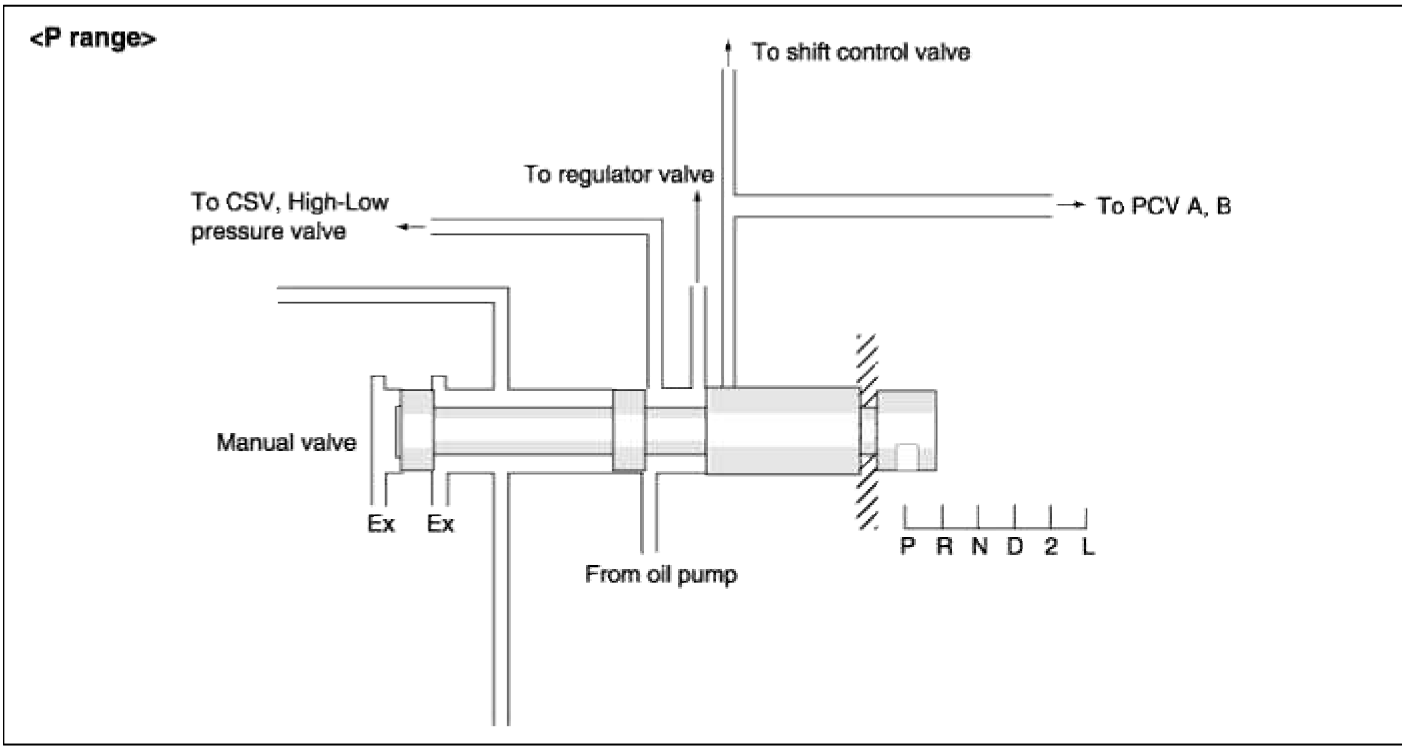

TORQUE CONVERTER
DAMPER CLUTCH
FRONT CLUTCH
REAR CLUTCH
LOW-REVERSE BRAKE
KICK DOWN SERVO
EX
DAMPER CLUTCH CONTROL SOLENOID VALVE
TCU
OFF
DAMPER CLUTCH CONTROL VALVE
ACCUMULATOR
REAR CLUTCH EXHAUST VALVE
2-3 & 4-3 SHIFT VALVE
L&R VALVE
FAIL SAFE VALVE
CONTROL SWITCH VALVE
END CLUTCH VALVE
ON
SHIFT CONTROL SOLENOID VALVE "C"
TO LUB. (REAR)
REDUCING VALVE
T/C CONTROL VALVE
SHIFT CONTROL SOLENOID VALVE "A"
1-2 SHIFT VALVE
HIGH-LOW PRESSURE VALVE
SHIFT CONTROL SOLENOID VALVE "B"
SHIFT CONTROL VALVE
TO LUB. (FRONT)
REGULATOR VALVE
PRESSURE CONTROL SOLENOID VALVE "B"
MANUAL VALVE
P R N D 2 L
PRESSURE CONTROL VALVE "A"
N-R CONTROL VALVE
PRESSURE CONTROL SOLENOID VALVE "A"
OIL FILTER
OIL PAN
OIL PUMP
LINE RELIEF VALVE
LINE PRESSURE
TORQUE CONVERTER AND LUBRICATION PRESSURE
REDUCING PRESSURE

REVERSE

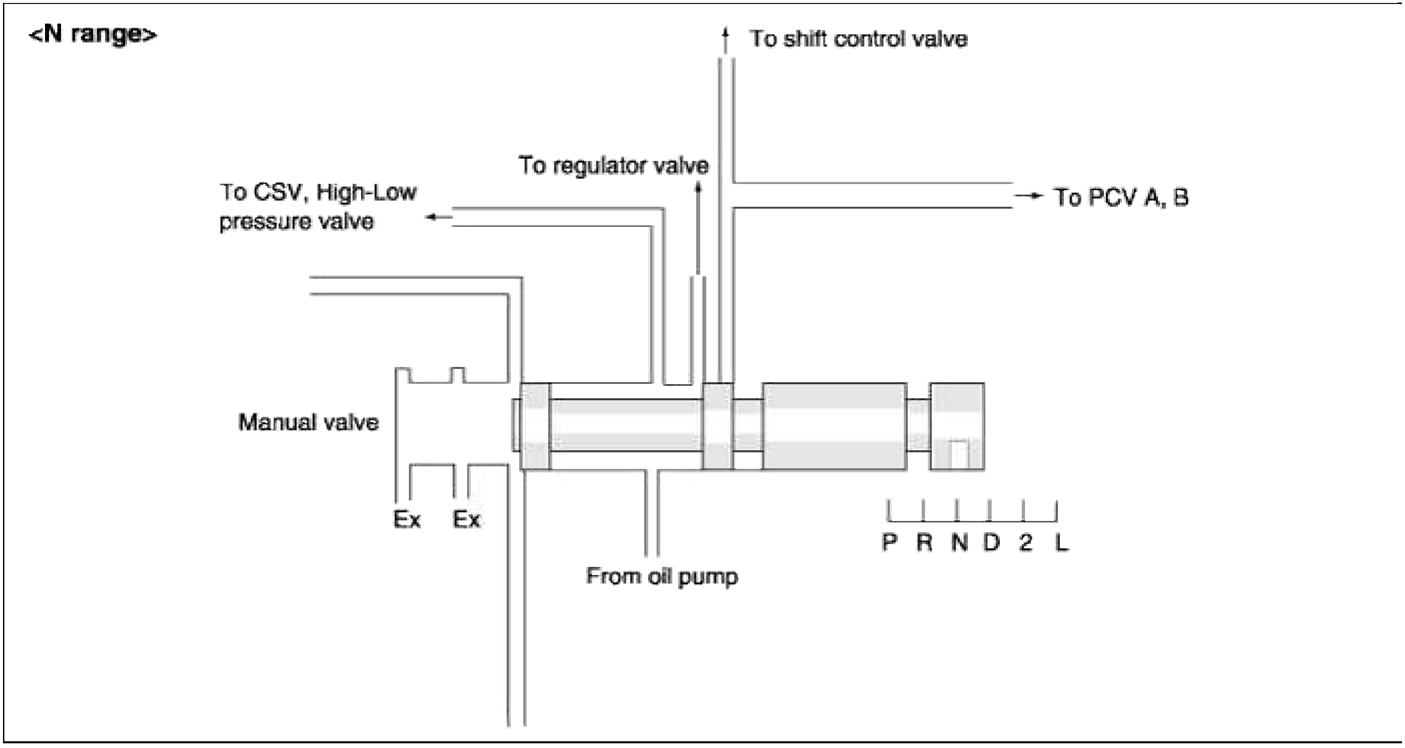

DAMPER CLUTCH
TORQUE CONVERTER
DAMPER CLUTCH CONTROL SOLENOID VALVE
TCU
OFF
EX
COOLER
TO LUB. (FRONT)
OIL FILTER
OIL PAN
OIL PUMP
T/C CONTROL VALVE
REGULATOR VALVE
DAMPER CLUTCH CONTROL VALVE
LINE RELIEF VALVE
TO LUB. (REAR)
REDUCING VALVE
REAR CLUTCH EXHAUST VALVE
REAR CLUTCH
MANUAL VALVE
SHIFT CONTROL SOLENOID VALVE "B"
SHIFT CONTROL VALVE
SHIFT CONTROL SOLENOID VALVE "A"
ACCUMULATOR
2-3 & 4-3 SHIFT VALVE
N-R CONTROL VALVE
P R N D 2 L
END CLUTCH
PRESSURE CONTROL VALVE "A"
PRESSURE CONTROL SOLENOID VALVE "B"
PRESSURE CONTROL SOLENOID VALVE "A"
KICK DOWN SERVO
L&R VALVE
1-2 SHIFT VALVE
END CLUTCH VALVE
FAIL SAFE VALVE
CONTROL SWITCH VALVE
SHIFT CONTROL SOLENOID VALVE "C"
HIGH-LOW PRESSURE VALVE
LINE PRESSURE
TORQJE CONVERTER AND LUBRICATION PRESSURE
REDUCING PRESSURE

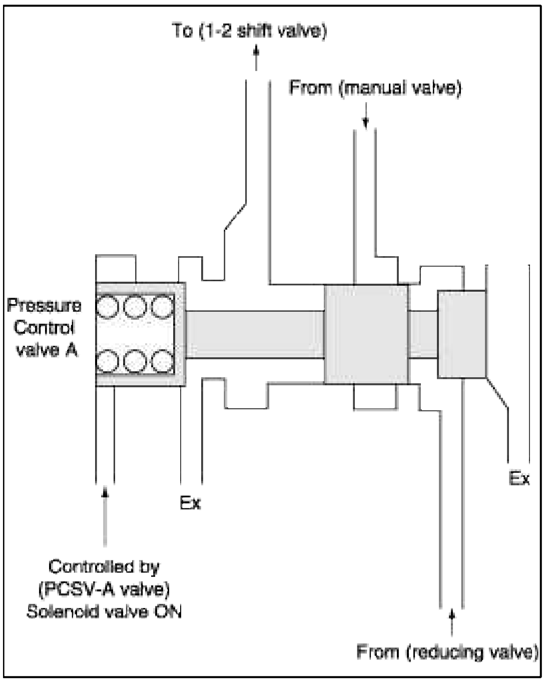
HYDRAULIC CONTROL SYSTEM
MANUAL VALVE

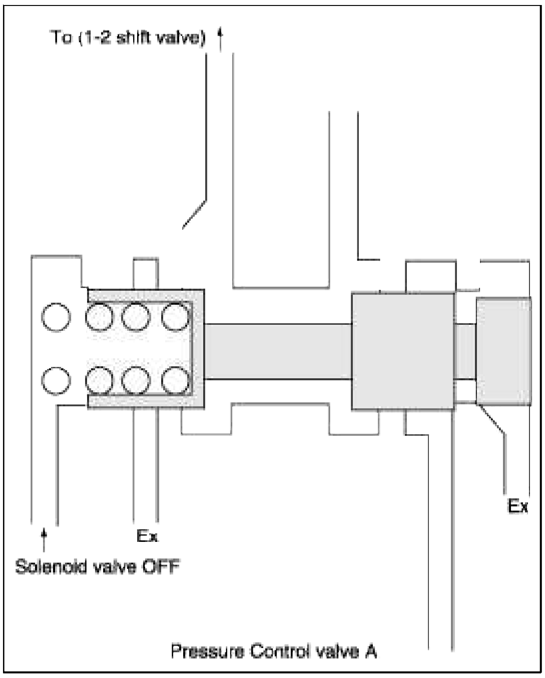

<D range>
To torque converter
To shift control valve
Regulator valve
Ex
To pressure control valve
Manual valve
Oil pump
Ex Ex
P R N D 2 L
Oil filter
Oil fan
Ex
To N-R control valve

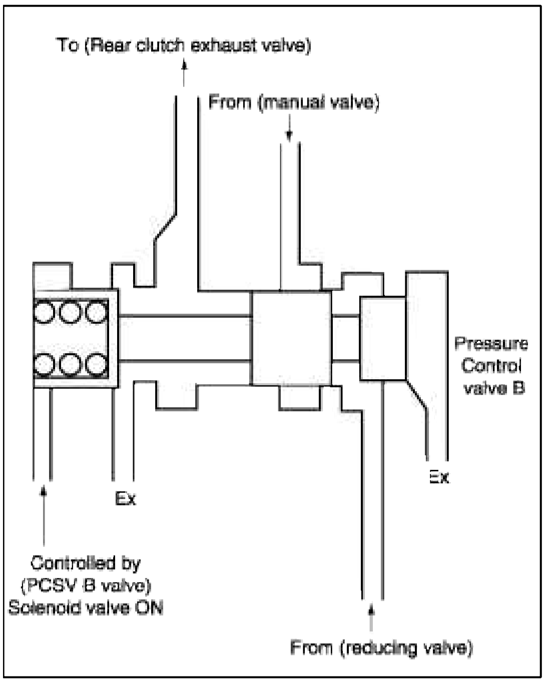

<P range>
To shift control valve
To regulator valve
To CSV, High-Low pressure valve
To PCV A, B
Manual valve
Ex Ex
From oil pump
P R N D 2 L

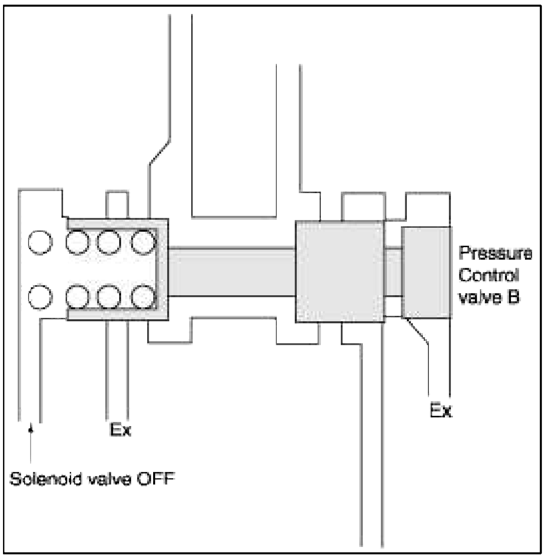
tomsn048@gmail.com


<N range>
To shift control valve
To regulator valve
To CSV, High-Low pressure valve
To PCV A, B
Manual valve
Ex
Ex
P R N D 2 L
From oil pump


To (1-2 shift valve)
From (manual valve)
Pressure Control valve A
Ex
Ex
Controlled by (PCSV-A valve) Solenoid valve ON
From (reducing valve)


To (1-2 shift valve)
Ex
Ex
Solenoid valve OFF
Pressure Control valve A


To (Rear clutch exhaust valve)
From (manual valve)
Pressure Control valve B
Ex
Ex
Controlled by (PCSV B valve) Solenoid valve ON
From (reducing valve)


Pressure Control valve B
Ex
Ex
Solenoid valve OFF

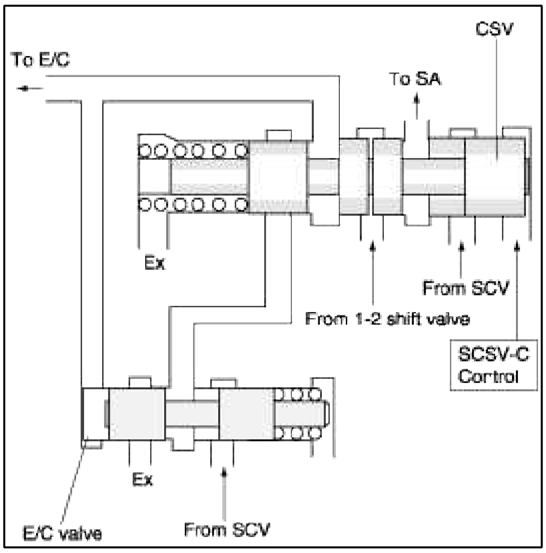
tomsn048@gmail.com

Operation	Shift control solenoid valve		
Position	**A**	**B**	**C**
1st gear	ON	ON	OFF
2nd gear	OFF	ON	OFF
3rd gear	OFF	OFF	ON
4th gear	ON	OFF	ON

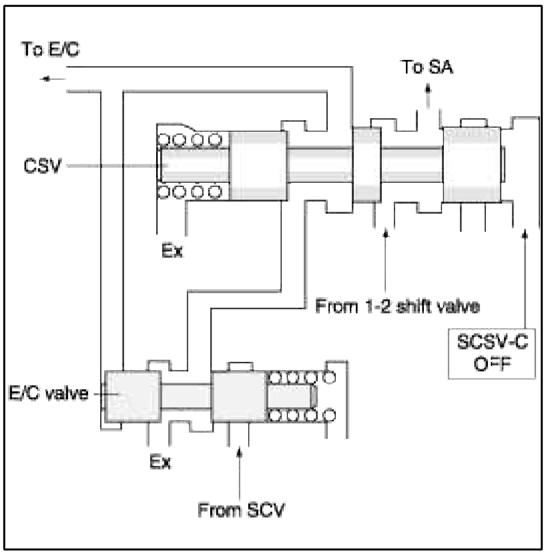
Items	A4AF2	A4AF3
Pressure Control for SA, E/C	PCV + PCSV PCV N-D V/v 1-2Shift V/v	PCV-A + PCSV-A PCV-A, 1-2Shift V/v
Pressure Control for R/C	PCV + PCSV PCV N-D V/v RCE V/v	PCV-B + Another Sol. V/v (PCSV-B) PCV-B, RCE V/v (with accumulator)

Changed points :

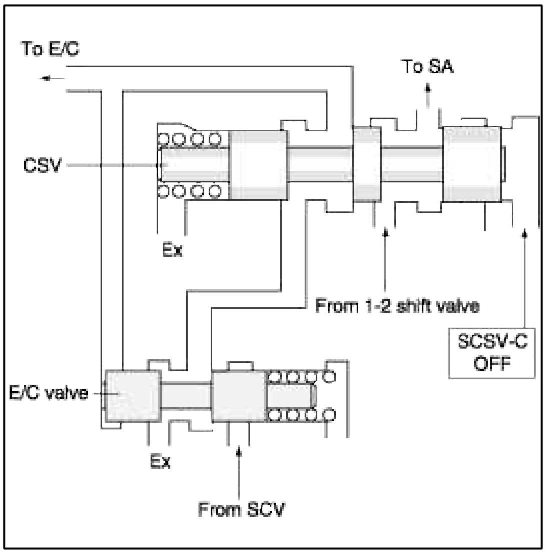
- N-D valve has been eliminated.
- PCSV-B has been added for Rear clutch pressure control independently.
- Mechanical accumulator has been adopted.
- E/C release control : PCV-A, Switching of SA, E/C :CSV
- Function
  Switching the pressure of E/C and SA.


CSV
To E/C
To SA
Ex
From SCV
From 1-2 shift valve
SCSV-C Control
Ex
E/C valve
From SCV

- 2nd. Gear


To E/C
To SA
CSV
Ex
From 1-2 shift valve
SCSV-C
OFF
E/C valve
Ex
From SCV

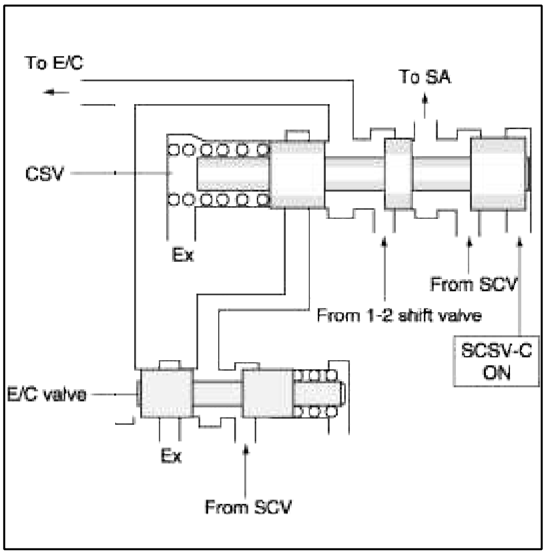
  - The 2nd. pressure is supplied to SA through CSV.
  - SCSV-C is OFF as well as 1st. gear.
- 2nd.→3rd. gear
  - SCSV-C maintains OFF as well as 2nd gear.
  - The E/C pressure from shift control valve is intercepted at the E/C valve during up-shifting from 2nd to 3rd gear.
  - SA pressure is supplied from 1-2 shift valve, but the front clutch and SR pressure is also supplied from the 2-3/4-3 shift valve, so the both SR and SA pressure will be set off.


To E/C
To SA
CSV
Ex
From 1-2 shift valve
SCSV-C
OFF
E/C valve
Ex
From SCV

- 3rd. gear

tomsn048@gmail.com

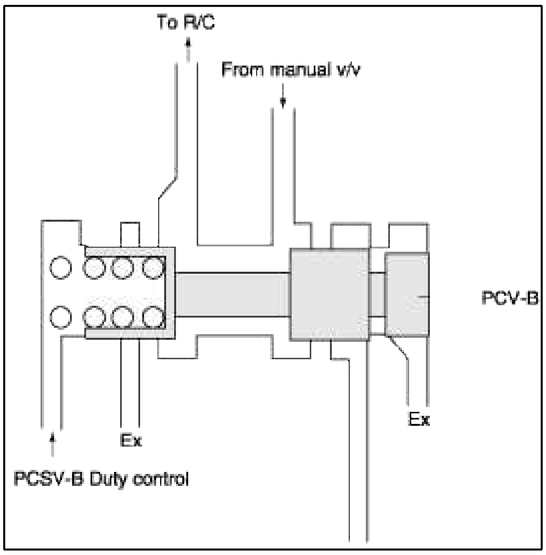
- SCSV-C is changed from OFF to ON.
- The E/C pressure is supplied from 1-2 shift valve at the CSV after finishing the up-shifting from 2nd to 3rd gear.
- SA pressure is supplied from shift control valve, but the front clutch and SR pressure is also supplied from the 2-3/4-3 shift valve, so the both SR and SA pressure will be set off.


To E/C
To SA
CSV
Ex
From SCV
From 1-2 shift valve
SCSV-C ON
E/C valve
Ex
From SCV

1. Operating elements

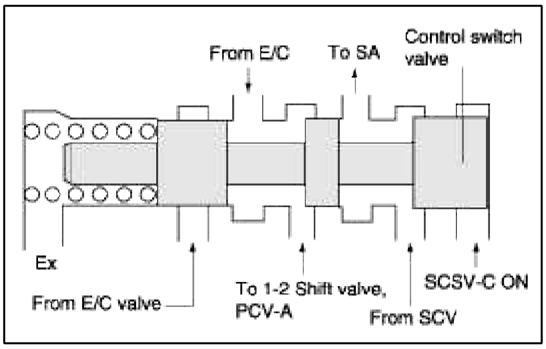
Speed	R/C	E/C	K/D
4th.	-	O	O
2nd.	O	-	O

2. Controls
   A. R/C engaging duty control
   B. E/C releasing duty control
   C. Continuous switching to SA
3. Description
   A. R/C engaging duty control


To R/C
From manual v/v
PCV-B
Ex
Ex
PCSV-B Duty control

B. E/C releasing duty control

4→2 Skip shift only (SCSV-C ON)


From E/C
To SA
Control switch valve
Ex
From E/C valve
To 1-2 Shift valve, PCV-A
SCSV-C ON
From SCV

When releasing the E/C clutch pressure, it is controlled by duty of PCSV-A only in case of 4→2 skip shift.

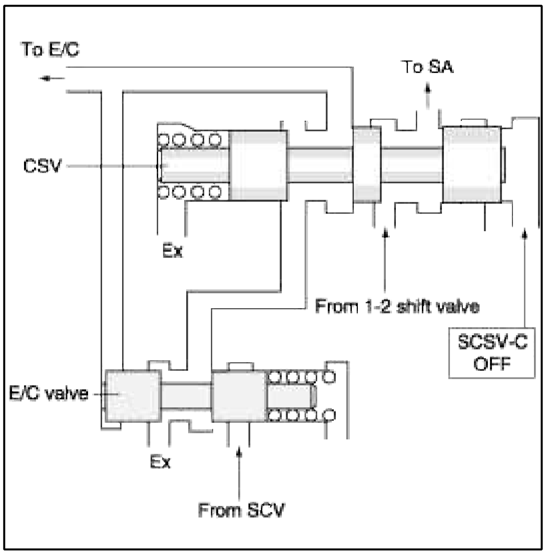
C. Continuous switching to SA

- From (SCV) to SA through (CSV)

1. TCM fail when drive with 1st or 2nd speed.

Speed	F/C	R/C	E/C	K/D
1st.		O		
2nd.		O		O
Fail	O	O		

- F/C, SR : from 2-3/4-3 shift valve
- R/C : from PCV-B
- SA : from 1-2 shift valve

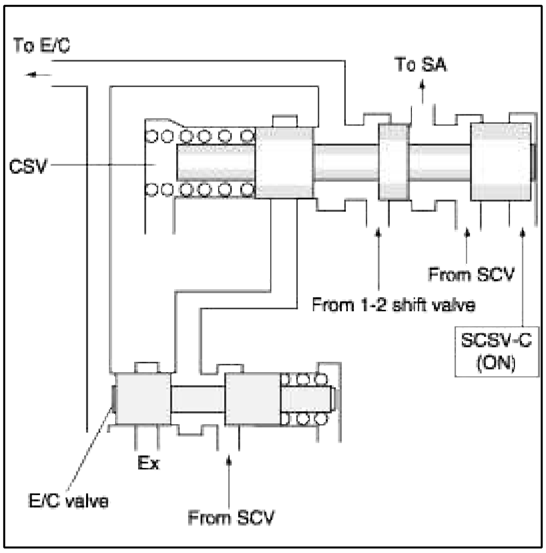

To E/C
To SA
CSV
Ex
From 1-2 shift valve
SCSV-C OFF
E/C valve
Ex
From SCV

2. TCM fail when drive with 1st or 2nd speed.

Speed	F/C	R/C	E/C	K/D
1st.		O		
2nd.		O		O
Fail		O	O	O

tomsn048@gmail.com

- R/C, E/C, SA : Interlock


To E/C
To SA
CSV
From SCV
From 1-2 shift valve
SCSV-C (ON)
Ex
E/C valve
From SCV

NOTE

- SA : Servo Apply pressure
- F/C : Front Clutch pressure
- R/C : Rear Clutch pressure
- K/D : Kick Down
- SCV : Shift Control Valve
- CSV : Control Switch Valve
- PCSV : Pressure Control Solenoid Valve
- SCSV : Shift Control Solenoid Valve
- PCV : Pressure Control Valve
- RCEV : Rear Clutch Exhaust Valve

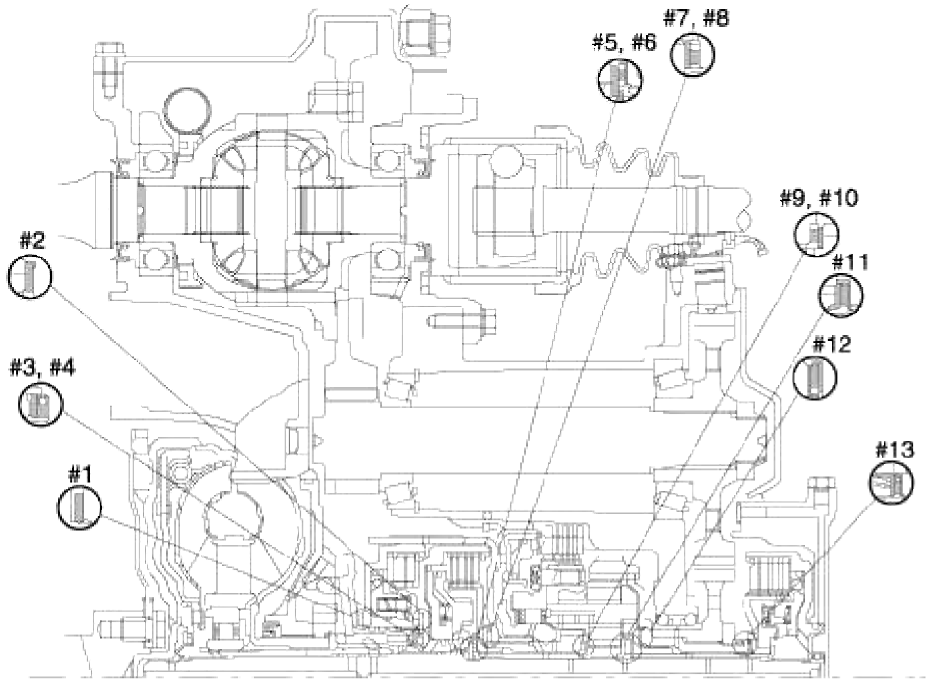
Automatic Transaxle System > Automatic Transaxle System > Automatic Transaxle > General Information

GENERAL INFORMATION (A4AF3)

Automatic transaxle overhaul section has been separated from the shop manual.
A4AF3 overhaul section was included in the overhaul manual.

SELECTION OF SHIM

O.D	I.D	Thickness	Code No.	O.D	I.D	Thickness	Code No.
70	55.7	1.4	#1	48.1	34.4	-	#4
70	55.7	1.8		40	21	2.4	#5
70	55.7	2.2		42.6	28	2.5	#6
70	55.7	2.6		54	38.7	1.6	#7
70	55.7	1.8	#2	52	36.4	2.8	#8
48.9	37	1.0	#3	41	28	2.0	#9
48.9	37	1.2		39	28	1.2	#10
48.9	37	1.4		38	22.2	-	#11
48.9	37	1.6		52	36.4	2.8	#12
48.9	37	1.8		58	44	5.0	#13
48.9	37	2.0					
48.9	37	2.2					
48.9	37	2.4					
Unit : mm							

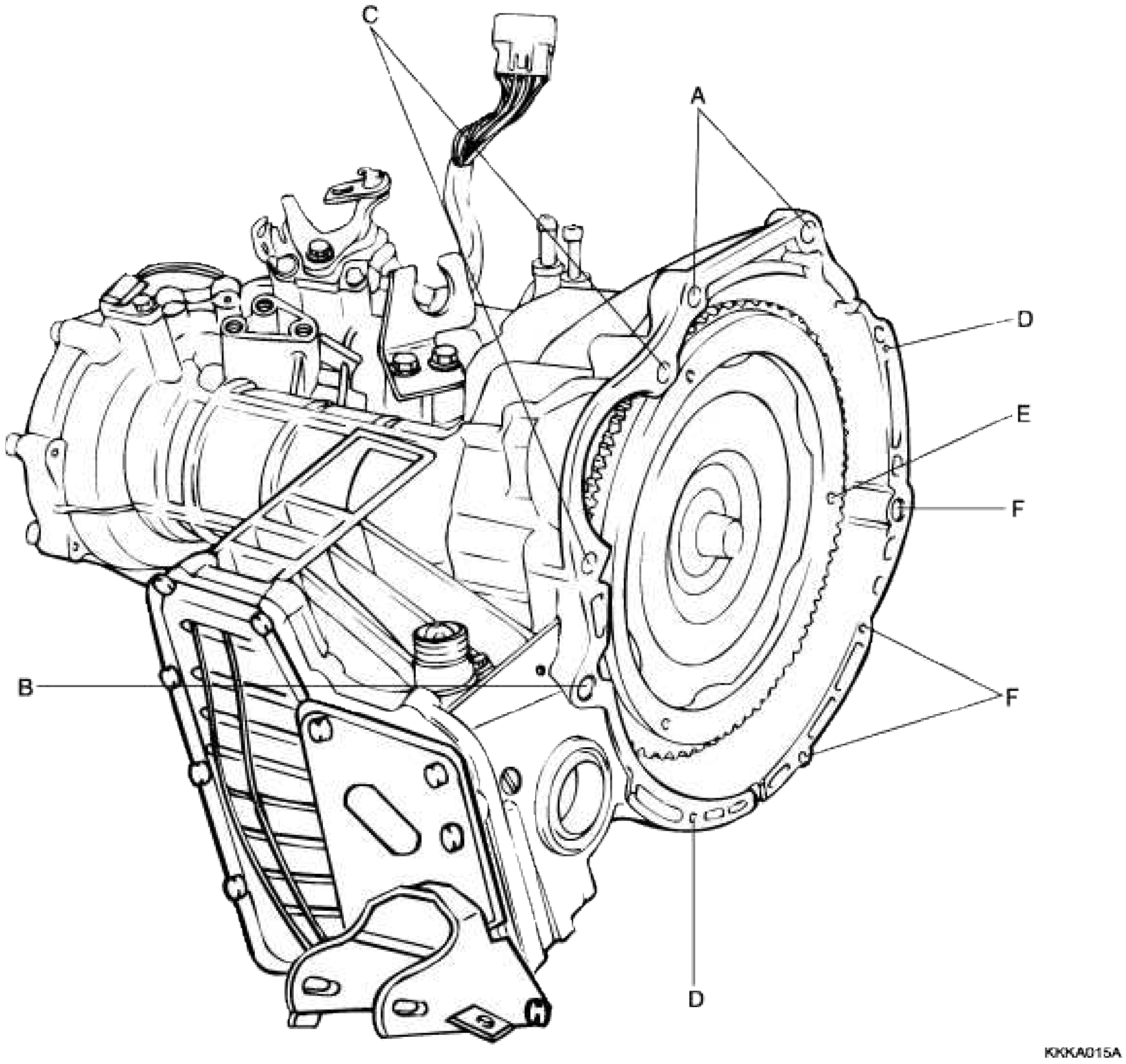


Automatic Transaxle System > Automatic Transaxle System > Automatic Transaxle > Components and Components Location

AUTOMATIC TRANSAXLE

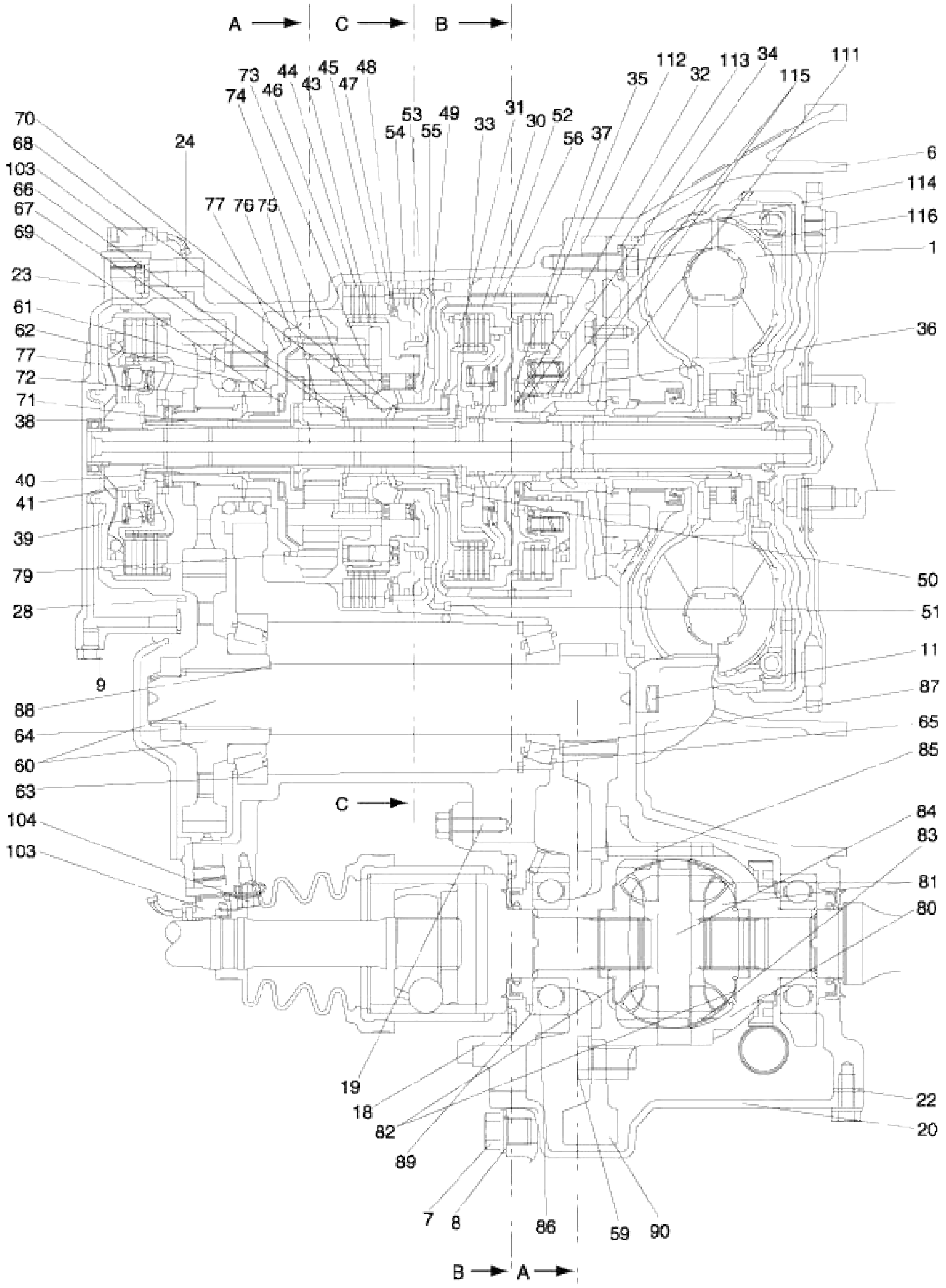
COMPONENTS

tomsn048@gmail.com



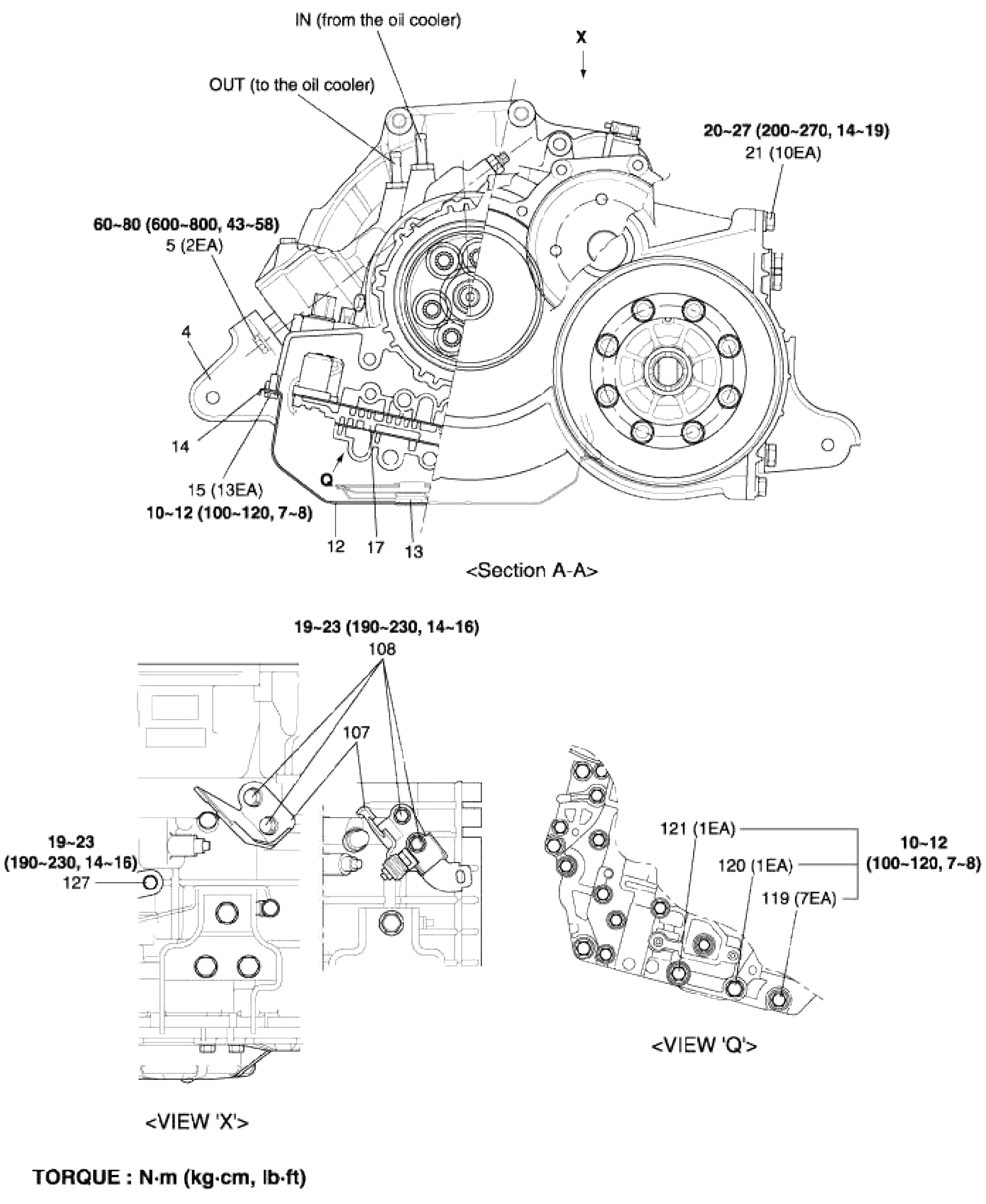
	Torque (kg·m)	O.D x Length (mm)	Identification Mark
A	6~8	$\boxed{7}$ 12x40	$\boxed{7}$ AxB
B	4.3~5.5	$\boxed{7}$ 10x70	
C	2.7~3.4	$\boxed{7}$ 10x55	
D	0.8~1.0	$\boxed{7}$ 6x10	
E	4.6~5.3	$\boxed{7}$ 10x11	

COMPONENTS (1)

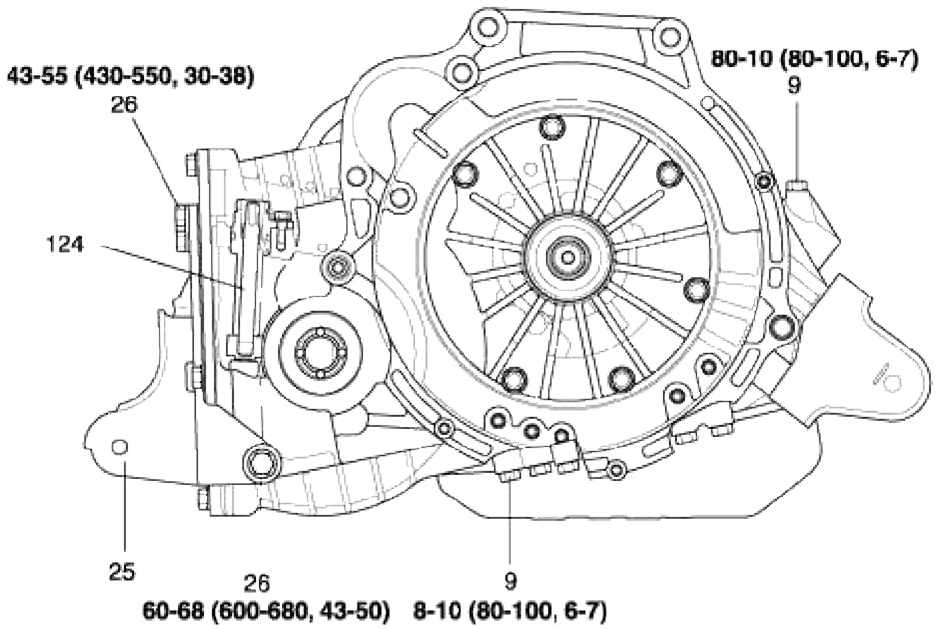

A
C
B
73
44
45
48
74
46
43
47
53
49
54
55
33
31
30
52
56
37
35
112
32
113
34
115
111
70
68
103
66
67
69
24
77
76
75
23
61
62
77
72
71
38
40
41
39
79
28
9
88
64
60
63
104
103
6
114
116
1
36
50
51
11
87
65
85
84
83
81
80
22
20
C
19
18
82
89
7
8
86
59
90
B
A

COMPONENTS (2)

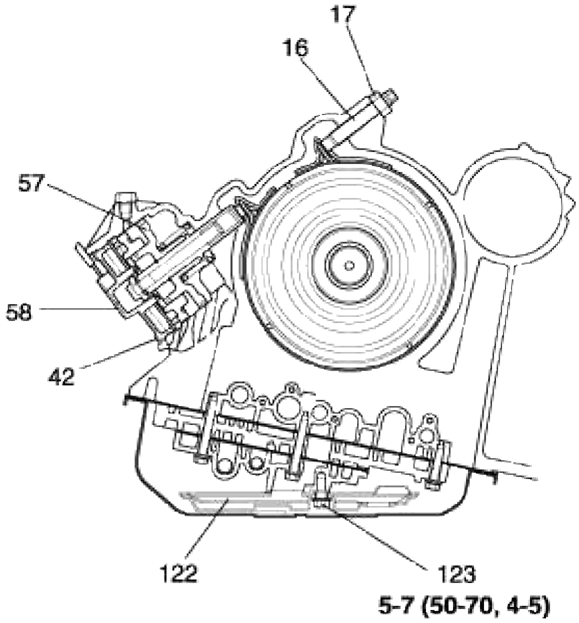
tomsn048@gmail.com


IN (from the oil cooler)
X
OUT (to the oil cooler)
20~27 (200~270, 14~19)
21 (10EA)
60~80 (600~800, 43~58)
5 (2EA)
4
14
Q
15 (13EA)
10~12 (100~120, 7~8)
12
17
13
<Section A-A>
19~23 (190~230, 14~16)
108
107
19~23
(190~230, 14~16)
127
121 (1EA)
120 (1EA)
119 (7EA)
10~12
(100~120, 7~8)
<VIEW 'Q'>
<VIEW 'X'>
TORQUE : N·m (kg·cm, lb·ft)

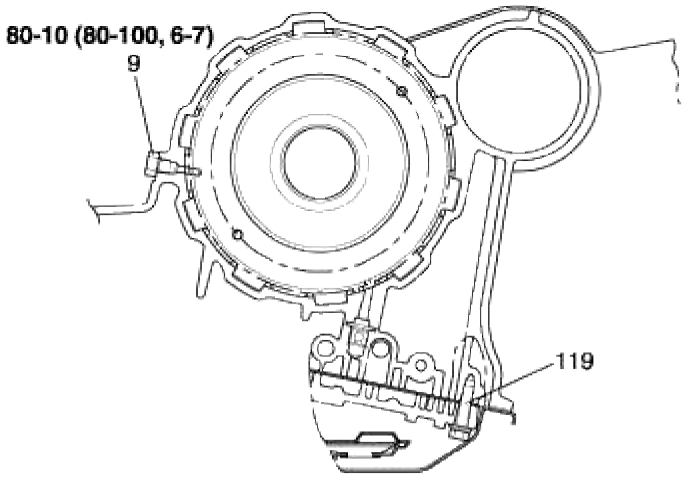
COMPONENTS (3)


43-55 (430-550, 30-38)
26
124
80-10 (80-100, 6-7)
9
25
26
60-68 (600-680, 43-50)
9
8-10 (80-100, 6-7)

<Front view>


17
16
57
58
42
122
123
5-7 (50-70, 4-5)

<Section B-B>

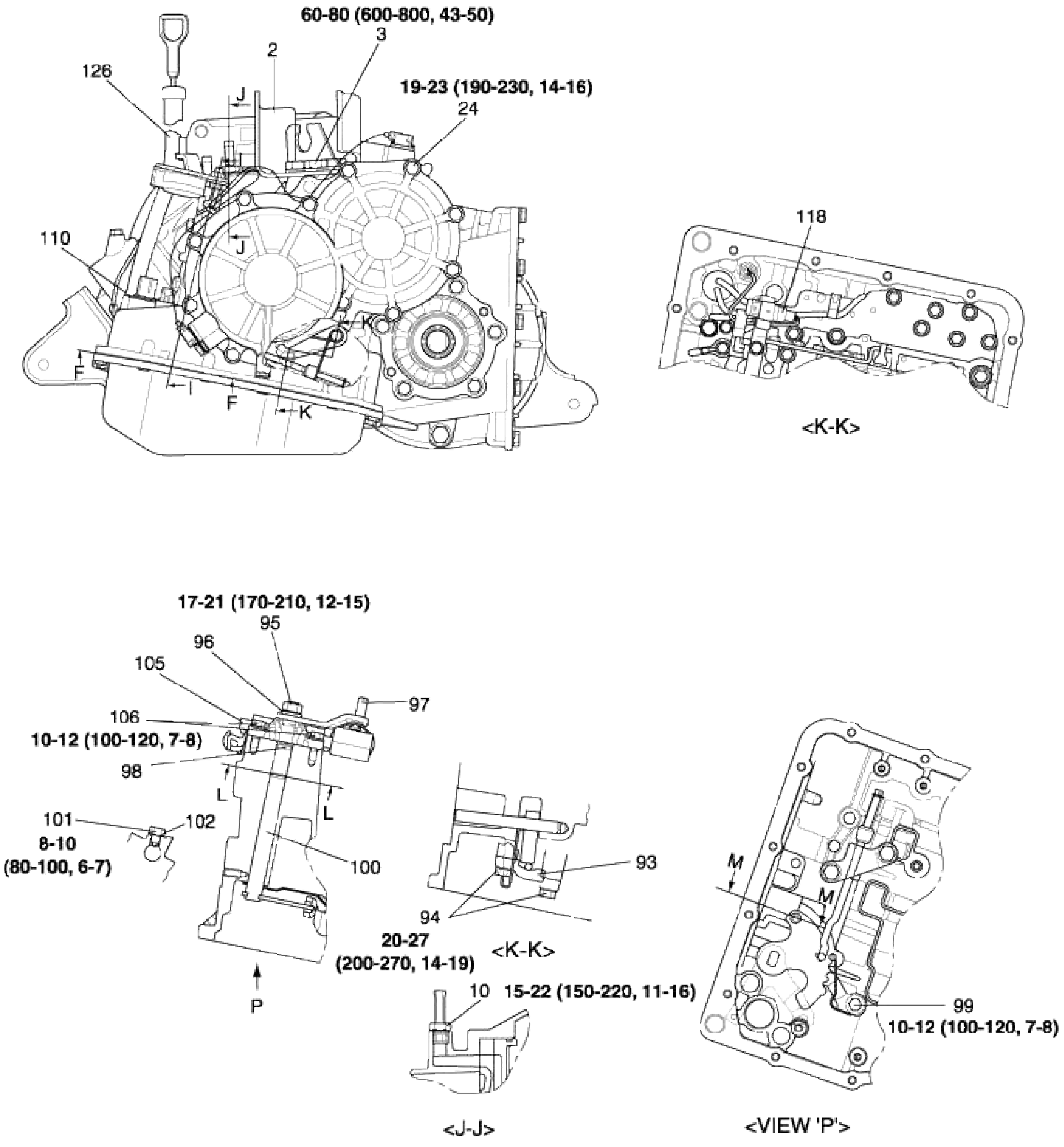

80-10 (80-100, 6-7)
9
119

<Section C-C>

TORQUE : N·m (kg·cm, lb·ft)

COMPONENTS (4)

tomsn048@gmail.com


60-80 (600-800, 43-50)
3
2
126
J
19-23 (190-230, 14-16)
24
J
110
K
F
I
F
K
118
<K-K>
17-21 (170-210, 12-15)
95
96
105
97
106
10-12 (100-120, 7-8)
98
L
L
101
102
8-10
(80-100, 6-7)
100
93
94
20-27
(200-270, 14-19)
<K-K>
P
M
M
99
10-12 (100-120, 7-8)
10
15-22 (150-220, 11-16)
<J-J>
<VIEW 'P'>

TORQUE : N·m (kg·cm, lb·ft)

COMPONENTS (5)

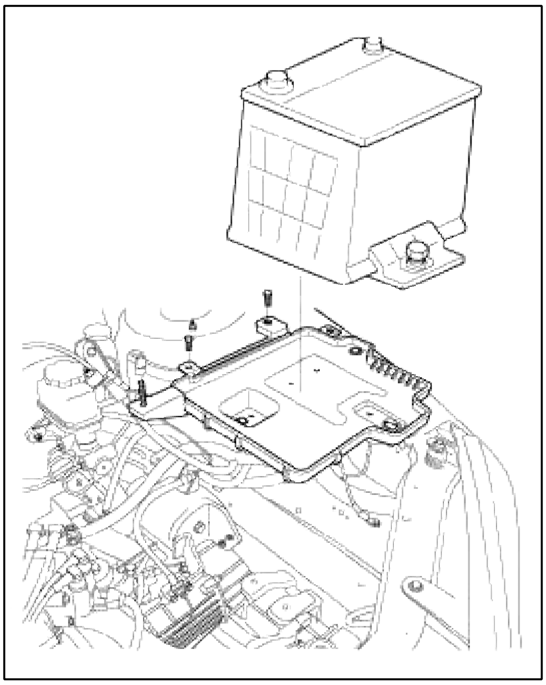
1. Torque converter
2. Transaxle support bracket
3. Bolt washer
4. Front roll support bracket
5. Bolt washer
6. Transaxle case
7. Drain plug
8. Gasket
9. Oil pressur check plug
10. Oil cooler connector
11. Sealing cap
12. Oil pan
13. Magnet
14. Oil pan gasket
15. Bolt
16. Adjuster screw
17. Nut
18. Differential bearing retainer
19. Flange bolt (8x25)
20. Differatial cover
21. Bolt washer
22. Gasket
23. End cover
24. Flange bolt
25. Rear roll support bracket
26. Seal bolt
27. Bolt (10x20)
28. O-ring
29. Air bleeder cap
30. Rear clutch
31. Rear clutch hub
32. Thrust bearing
33. Thrust bearing
34. Thrust bearing
35. Front clutch
36. Thrust washer
37. Thrust washer
38. End clutch
39. End clutch hub
40. Thrust washer
41. Thrust bearing
42. Snap ring
43. Brake disc
44. Brake plate
45. Brake pressure plate
46. Brake reaction plate
47. Return spring
48. Wave spring
49. Thrust bearing
50. Thrust race
51. Snap ring
52. Kick down drum
53. Packing
54. Low & reverse brake piston
55. Center support
56. Kick down band
57. Kick down servo & spring piston
58. Kick down servo switch
59. Flywheel bolt
60. Transfer driven gear set
61. Bolt
62. Double angular
63. Taper roller bearing
64. Locking nut
65. Snap ring
66. Thrust bearing
67. Thrust race
68. Seal ring
69. Thrust bearing
70. Snap ring
71. End clutch shaft
72. Locking nut
73. Planetary carrier
74. Reverse sun gear
75. Forward sun gear
76. Anulus gear
77. Transfer drive gear
78. Output flange
79. Snap ring
80. Differential case
81. Differential gear
82. Differential gear spacer
83. Washer
84. Pinion shaft
85. Lock pin
86. Ball bearing
87. Side bearing
88. Spacer
89. Spacer
90. Differential drive gear
91. Speedometer drive gear
92. Stopper plate
93. Sprag rod support
94. Flange bolt (8x25)
95. Nut
96. Spring washer
97. Manual control lever
98. O-ring
99. Bolt
100. Manual control
101. Screw
102. Sealing washer
103. Pulse generator
104. Flange bolt (6x14)
105. Transaxle range switch
106. Flange bolt
107. Shift cable bracket
108. Flange bolt
109. Clamp
110. Snap ring
111. Oil pump
112. Oil pump gasket
113. Seal washer
114. O-ring
115. Seal ring
116. Seal bolt
117. Valve body
118. Oil temperature sensor
119. Bolt (6x26)
120. Bolt (6x36)
121. Bolt (6x41)
122. Oil filter
123. Flange bolt (6x12)
124. Speedometer driven gear sleeve
125. Flange bolt (6x14)
126. Oil level gauge & filler tube
127. Flange bolt (8x16)
128. Oil level gauge

Automatic Transaxle System > Automatic Transaxle System > Automatic Transaxle > Repair procedures

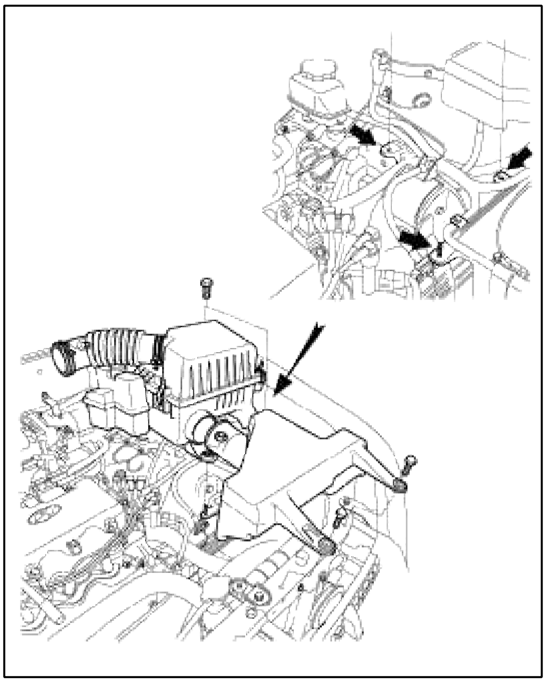
REMOVAL

tomsn048@gmail.com

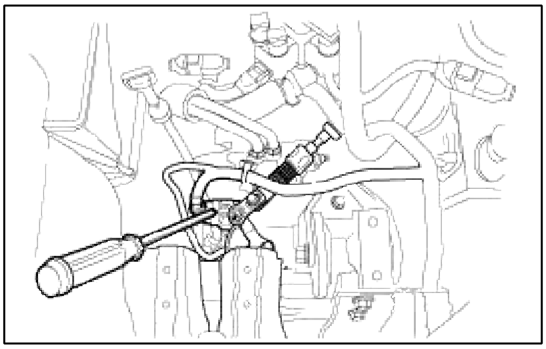
1. Remove the battery terminal and the battery.



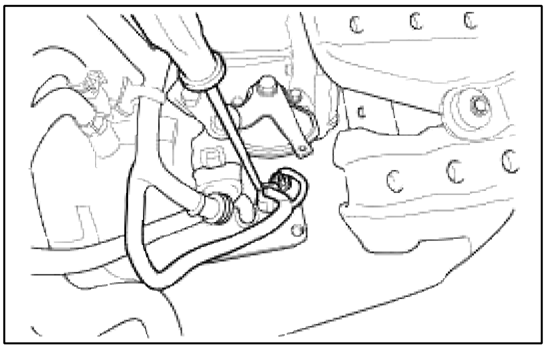
2. Removal the air cleaner.



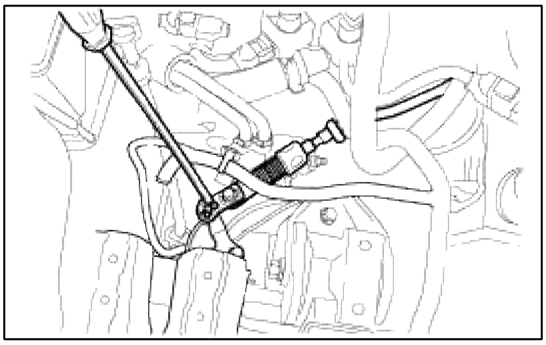
3. Remove the transaxle range switch connector.



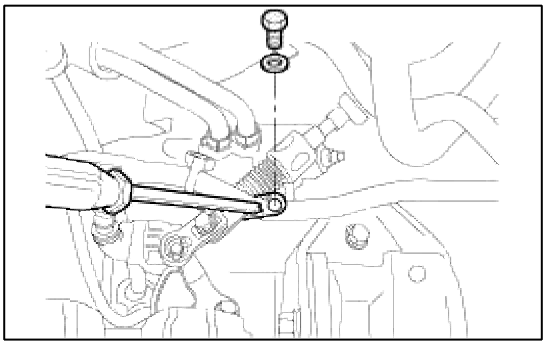
4. Remove the solenoid valve connector and the oil temperature sensor connector.



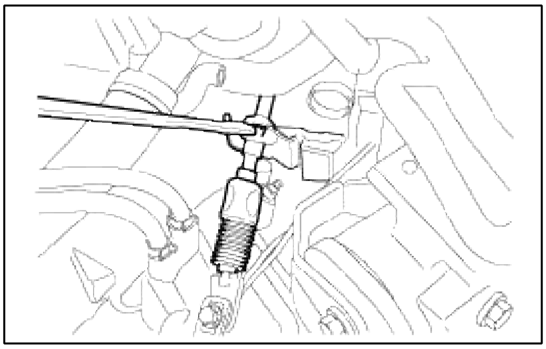
5. Remove the cotter pin of the control cable.



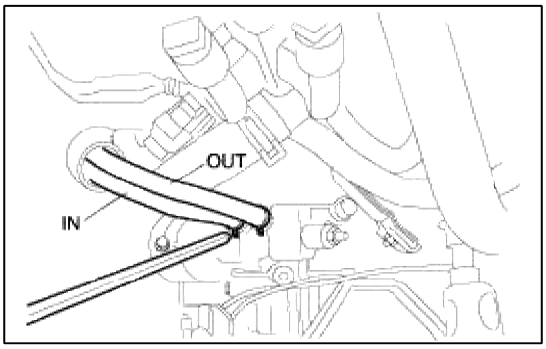
6. Remove the oil filler tube.



7. Remove the clip of the control cable.

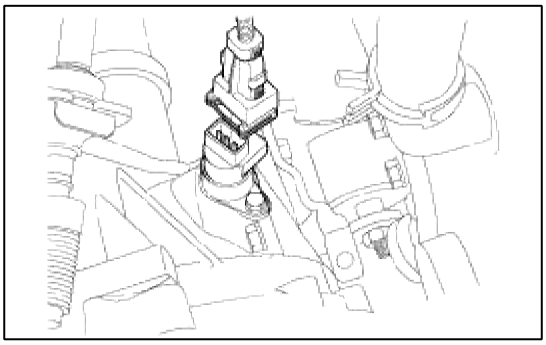


8. Remove the oil cooler hose.

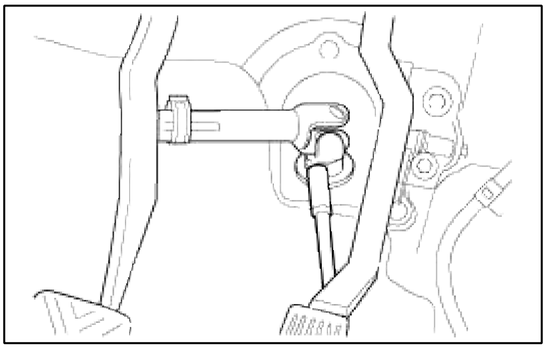


tomsn048@gmail.com

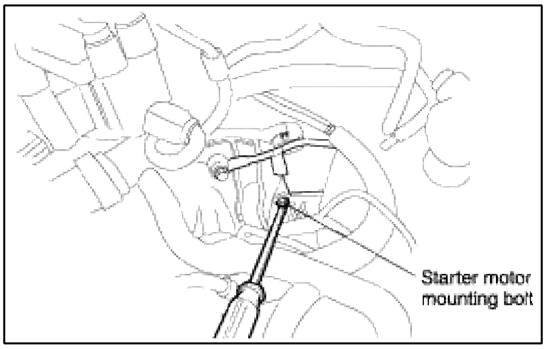
9. Remove the speedometer driven gear connector.
   (speed sensor connector)



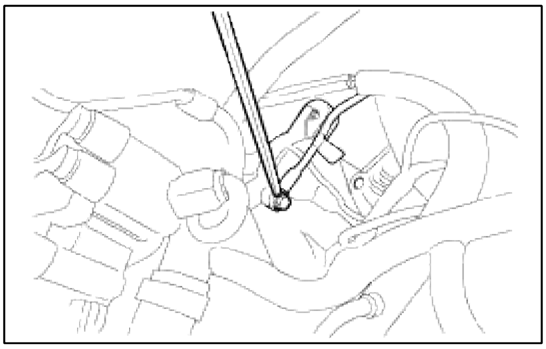
10. Remove the u-joint.



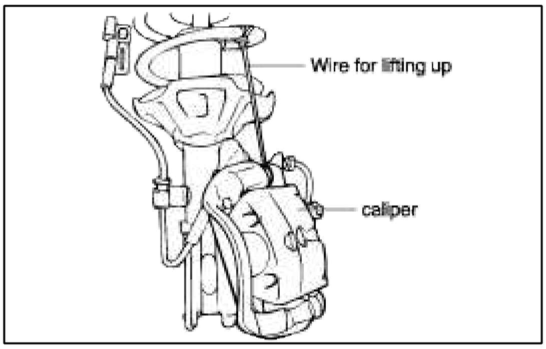
11. Remove the power steering return hose.
12. Remove the tire.
13. Remove the starter motor.



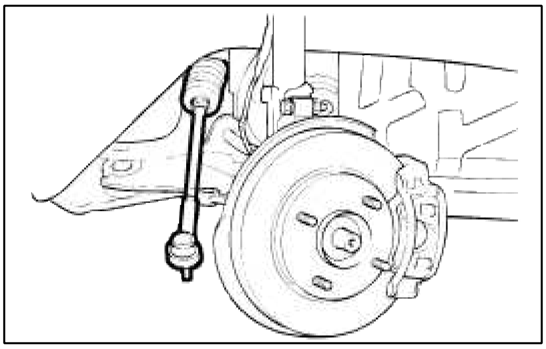
14. Remove the bolt for the upper connection of the engine and the transaxle.



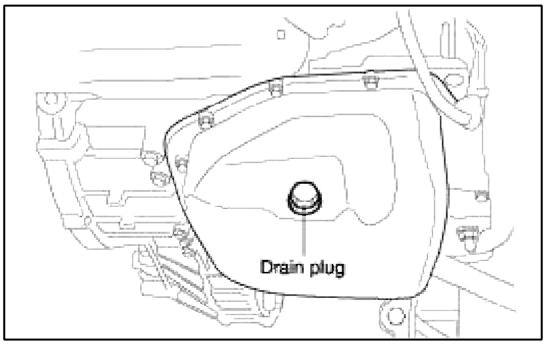
15. Remove the caliper after lifting up the vehicle.


Wire for lifting up
caliper

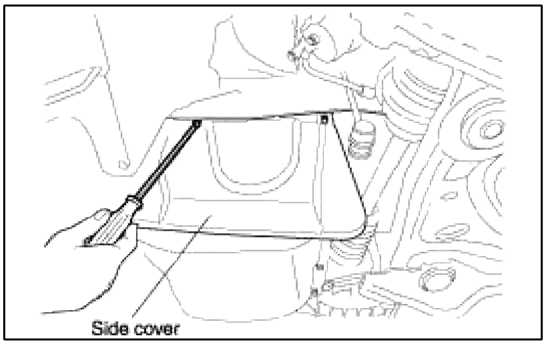
16. Separate the tie rod end from the pin and nut.



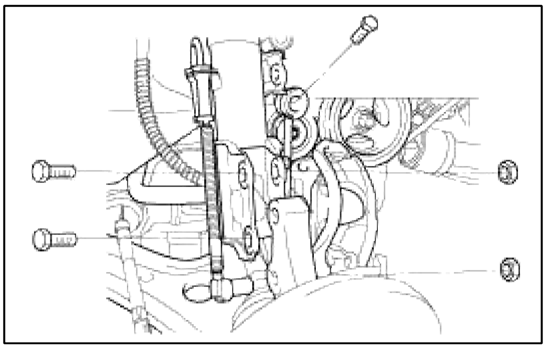
17. Remove the oil drain plug and drain the oil.



18. Remove the transaxle side cover.

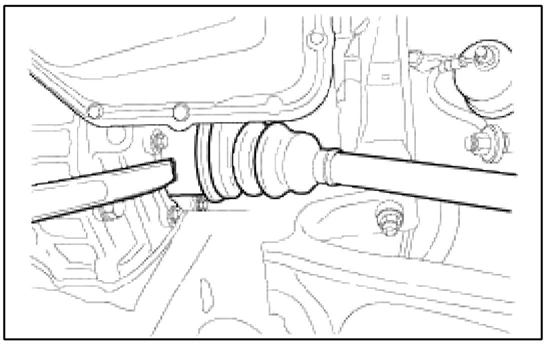


19. Remove the wheel speed sensor and the knuckle mounting bolt.

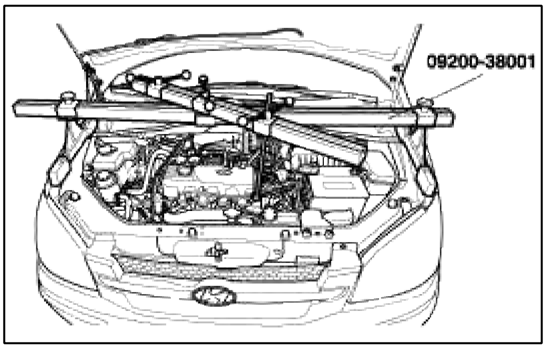


tomsn048@gmail.com

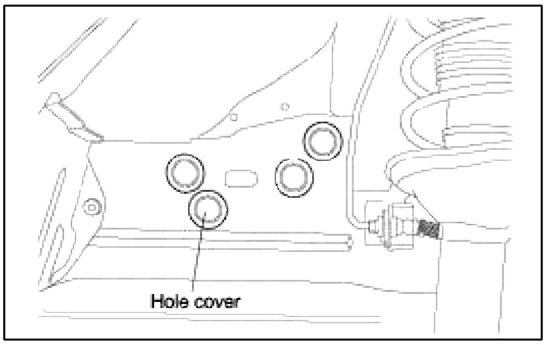
20. Remove the drive shaft and the left side hub nut.



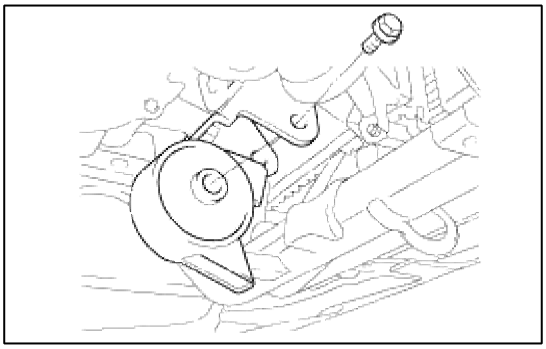
21. Install the special tool, the engine support fixture on the engine assembly.



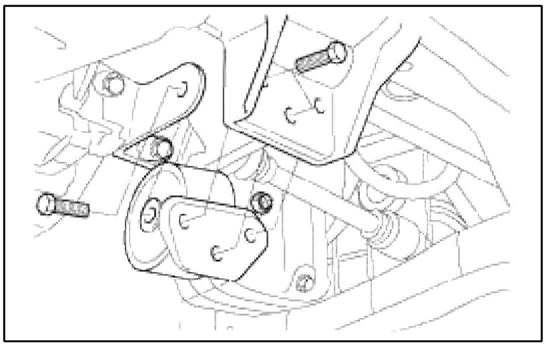
22. Remove the transaxle mounting bracket after removing the hole cover and the mounting bolts.



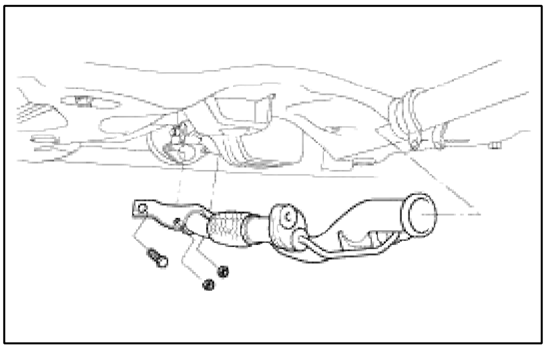
23. Remove the front roll stopper.



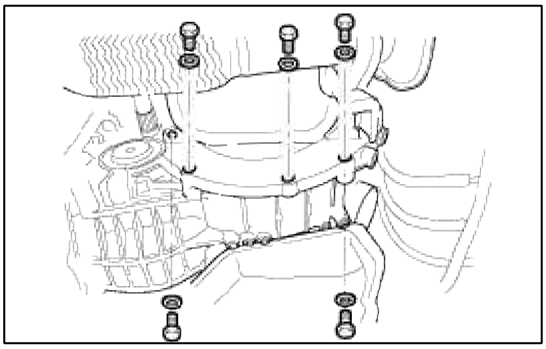
24. Remove the rear roll stopper.



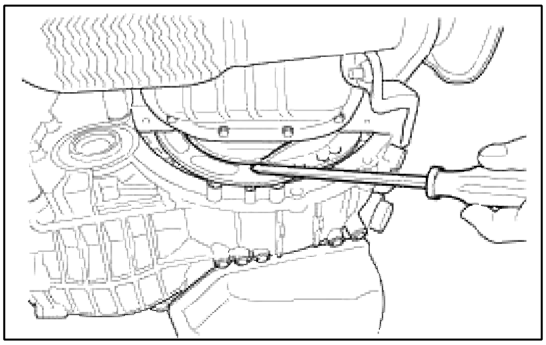
25. Remove the front muffler.



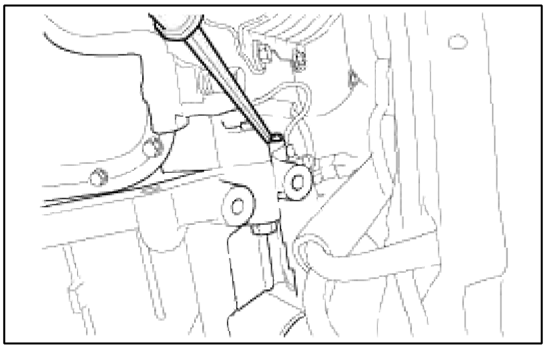
26. Remove the bell housing cover. (Bolts : 5EA)



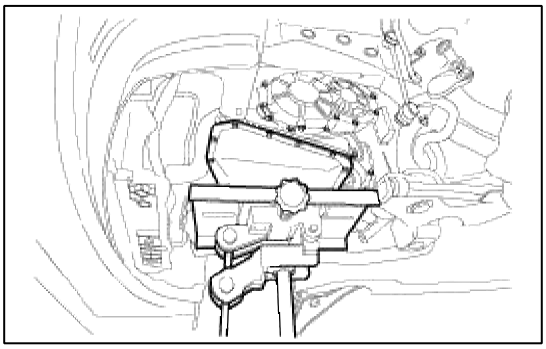
27. Remove the torque converter mounting plate bolts (3EA).



28. Remove the cylinder block plate bolt.



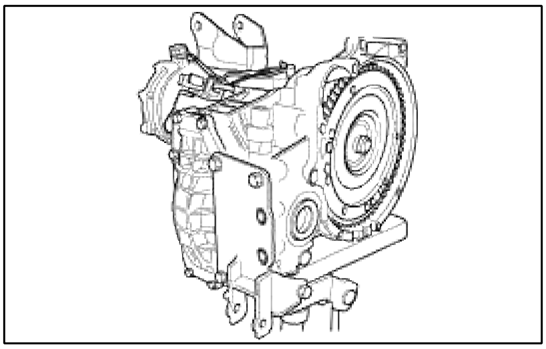
29. Install the jack for supporting transaxle.



30. Remove the lower mounting bolts (2EA) of the transaxle.
31. Remove the sub frame.

tomsn048@gmail.com

32. Remove the transaxle.



INSTALLATION

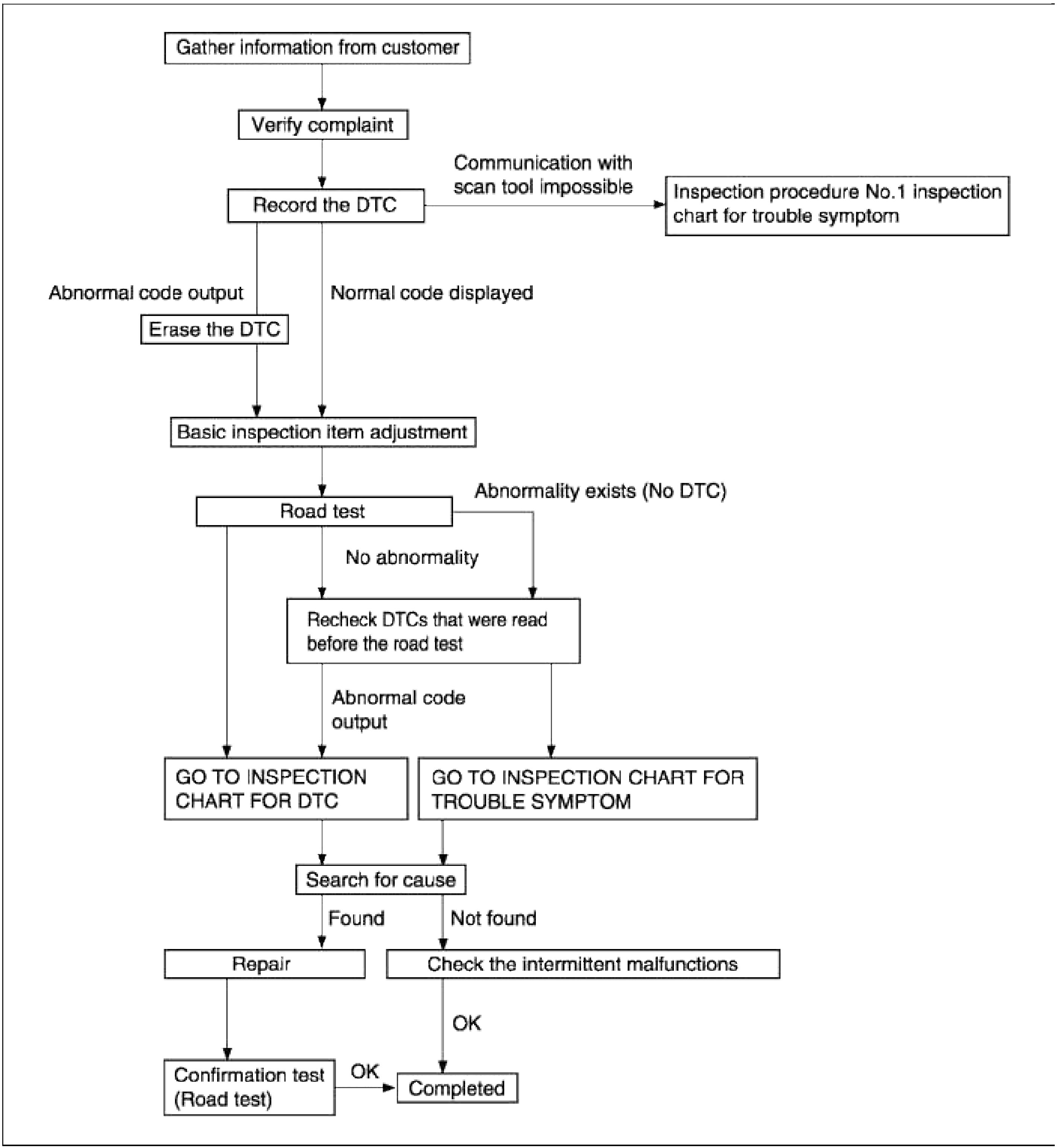
1. Attach the torque converter on the transaxle side and mount the transaxle assembly onto the engine.

> **CAUTION**
>
> - If the torque converter is mounted on the engine first, the oil seal on the transaxle side may be damaged. Therefore, be sure to first assemble the torque converter to the transaxle.
> - When installing the roll stopper mounting bracket, be careful not to crush the insulator. If crushed, idle vibration may occur.

2. Install the transaxle control cable and adjust as follows:
   A. Move the shift lever and the transaxle range switch to the "N" position and install the control cable.
   B. When connecting the control cable to the transaxle mounting bracket, install the clip until it contacts to the control cable.
   C. Remove any free-play in the control cable by adjusting the nut and then check to see that the selected lever moves smoothly.
   D. Check to see that the control cable has been adjusted correctly.

Automatic Transaxle System > Automatic Transaxle System > Troubleshooting

TROUBLESHOOTING (A/T)


Gather information from customer
Verify complaint
Communication with scan tool impossible
Inspection procedure No.1 inspection chart for trouble symptom
Record the DTC
Abnormal code output
Normal code displayed
Erase the DTC
Basic inspection item adjustment
Abnormality exists (No DTC)
Road test
No abnormality
Recheck DTCs that were read before the road test
Abnormal code output
GO TO INSPECTION CHART FOR DTC
GO TO INSPECTION CHART FOR TROUBLE SYMPTOM
Search for cause
Found
Not found
Repair
Check the intermittent malfunctions
OK
Confirmation test (Road test)
OK
Completed

ROAD TEST

Procedure	Conditions	Operation	Judgement value	Inspection item	Inspection procedure if there is an abnormality
1	Ignition switch:ON Engine stopped	Overdrive switch • ON • OFF	• OD • OD-OFF	Overdrive switch	Overdrive switch system
2	Engine: Stopped	Starting test with lever in P or N range	Starting should be possible	Starting possible or impossible	Starting impossible (will not crank)

3	Warming up	Drive for 15 minutes or more so that the automatic transmission fluid temperature 70~110°C	Gradually rises to 70~110°C	Oil temperature sensor	Codes - P0712, P0713 Oil temperature sensor system
4	Engine:Idling Selector lever:N	Accelerator pedal • Fully closed • Depressed • Fully open (for at least 2 seconds)	• 2~18% • Gradually rises from (1) • 80 ~ 100%	TPS	TPS system
		Selector lever operation • N→D shift • N→D shift	Should be no abnormal shifting shocks. Time lag should be within 2 seconds.	Malfunction when starting	Engine stalling during shifting
					Shocks when changing from N to D and long lag time
					Shocks when changing from N to R and long lag time
					Shocks when changing from N to D, N to R and long lag time
	Engine:Idling (Vehicle stopped) Selector lever position:D	Selector lever operation • N→D • N→R shift	Should be no abnormal shifting shocks. Time lag should be within 2 seconds.	Driving impossible	Does not move forward
					Does not move (forward or reverse)
5	Engine:Idling (Vehicle stopped) Selector lever position:D	Accelerator pedal • Fully closed • Depressed [Driving at 5km/h (3.1 mph)]	• 75~90% • 100%	Pressure control solenoid valve (PCSV) - A, B	Code P0745, P0775 - Pressure control solenoid valve system
		Accelerator pedal • Fully closed • Depressed	• C • 1	Shift control solenoid valve A (SCSV-A)	Code P0750 - Shift control solenoid valve A system
					Code P0755 - Shift control solenoid valve B system
					Code P0760 - Shift control solenoid valve C system
	Selector lever position:D	Engine • Idling (vehicle	• C • 1	Shift control solenoid	Code P0750 - Shift control solenoid valve A

6	Overdrive:OFF	stopped) • Driving at 10km/h • Driving at constant speed of 50km/h (31mph) (20 seconds or more) • Driving at constant speed of 40km/h (25mph) with selector lever in 2 range • Driving at constant speed of 70km/h (43mph) with selector lever in D range	• 3 • 2	valve A (SCSV-A)	system
				Shift control solenoid valve B (SCSV-B)	Code P0755 - Shift control solenoid valve B system
				Shift control solenoid valve C (SCSV-C)	Code P0760 - Shift control solenoid valve C system
			• OFF • ON • ON • OFF	Kickdown servo switch	Code P1709 - Kickdown servo switch system
			• 0km/h • 10km/h • 50km/h • 40km/h	Vehicle speed sensor	Vehicle speed sensor system
			(3) 1,500~2,000rpm	Pulse generator A (PG-A)	Code P0717 - Pulse generator A system
			(3) 1,500~2,000rpm	Pulse generator B (PG-B)	Code P0722 - Pulse generator B system
			(3) 100~300rpm (5) 0~10rpm	Torque converter clutch solenoid	Code P0743 - Torque converter clutch solenoid
			(5) TCCS Duty : 40~85	Torque converter clutch solenoid	Code P0743 - Torque converter clutch solenoid
			For (3) and (5), acceleration should be smooth with no abnormal vibration	Malfunction while driving	Poor acceleration
					Vibration
	Selector lever position:D Overdrive:ON	Engine (1) Driving at constant speed of 50km/h (31mph) (20 seconds or more)	(1) 3 speed gear (1) 1,500~2,000rpm	Shift control solenoid valve A (SCSV-A)	Code P0750 - Shift control solenoid valve A system
				Shift control solenoid valve B (SCSV-B)	Code P0755 - Shift control solenoid valve B system

tomsn048@gmail.com

7				Shift control solenoid valve C (SCSV-C)	Code P0760 - Shift control solenoid valve C system
				Pulse generator A (PG-A)	Code P0717 - Pulse generator A system
				Pulse generator B (PG-B)	Code P0722 - Pulse generator B system
8	Selector lever position:D Overdrive:ON	• Accelerate to 4th gear at TPS output of 1.5V (opening angle 30%) • Slowly decelerate to a standstill • Accelerate to 4th gear at TPS output of 2.5V (opening angle 50%) • At 50km/h (31mph) in 4th gear, turn overdrive OFF • At 50km/h (31mph) in 3rd gear, move selector lever to 2 range • At 20km/h (12mph) in 2 range, move selector lever to L range.	For (1), (2) and (3) should match the specified output shaft speed (vehicle speed0, and there should be no abnormal shocks. For (4), (5) and (6), down shifting should be made immediately after operation.	Malfunction when shifting	Shocks and flare shifts
				Displaced shifting points	All points
				Does not shift	No fail-safe codes
					Code P0717 - Pulse generator A system
					Code P0722 - Pulse generator B system
					Code P0750 - Shift contorl solenoid valve A system
					Code P0755 - Shift control solenoid valve B stystem
					Code P0760 - Shift contorl solenoid valve C system
					Code P0745, P0775 - Pressure control solenoid valve system
					Code P0731 - 1st gear incorrect ratio
					Code P0732 - 2nd gear incorrect ratio
					Code P0733 - 3rd gear incorrect ratio
					Code P0734 - 4th gear incorrect ratio

INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES

DTC NO	Diagnosis items	Trouble area (Remedy)	MIL
P0703	Brake switch	• Check the brake switch	X

P0712	Fluid temperature sensor -short circuit-	• Fluid temperature sensor connector inspection • Fluid temperature sensor inspection • Fluid temperature sensor wiring harness inspection	O
P0713	Fluid temperature sensor -open circuit-		
P1709	Kickdown servo switch -open circuit-	• Check the kicdown servo switch connector • Check the kicdown servo switch • Check the kicdown servo switch wiring harness	X
	Kickdown servo switch -short circuit-		
P0717	Pulse generator A -open circuit-	• Check the pulse generator A and pulse generator B • Check the vehicle speed reed switch (for chattering) • Check the pulse generator A and B wiring harness	O
P0722	Pulse generator B -open circuit-		
P0750	Shift control solenoid valve A	• Check the solenoid valve connector • Check the shift control solenoid valve A • Check the shift control solenoid valve A wiring harness	O
P0755	Shift control solenoid valve B	• Check the solenoid valve connector • Check the shift control solenoid valve B • Check the shift control solenoid valve A wiring harness	O
P0760	Shift control solenoid valve C	• Check the solenoid valve connector • Check the shift control solenoid valve C • Check the shift control solenoid valve A wiring harness	O
P0707	Transaxle range switch -No signal-	• Check the transaxle range switch connector and harness	O
P0708	Transaxle range switch -Multi signal-		
P0745	Pressure control solenoid - A valve open circuit	• Check the pressure control solenoid valve • Check the pressure control solenoid valve wiring harness	O
P0775	Pressure control solenoid - B valve shor circuit		
P0743	Damper clutch control solenoid	• Inspection of solenoid valve connector • Individual inspection of damper clutch control solenoid valve • Check the damper clutch control solenoid valve wiring harness • Check the PCM • Inspection of damper clutch hydraulic system	O
P0741	Damper clutch -Stuck OFF-		
P0742	Damper clutch -Stuck ON-		

tomsn048@gmail.com

P0731	First gear system -Malfunction-	• Check the pulse generator A and pulse generator B connector • Check the one way clutch or rear clutch • Check the pulse generator wiring harness	O
P0732	Second gear system -Malfunction-		
P0733	Third gear system -Malfunction-	• Check the rear clutch or control system • Check the pulse generator A and pulse generator B connector • Check the front clutch slippage or control system • Check the pulse generator wiring harness • Check the rear clutch slippage or control system	O
P0734	Fourth gear system -Malfunction-	• Check the pulse generator A and pulse generator B connector • Kickdown brake slippage • Check the end clutch or control system • Check the pulse generator wiring harness	O

FAIL-SAFE ITEM

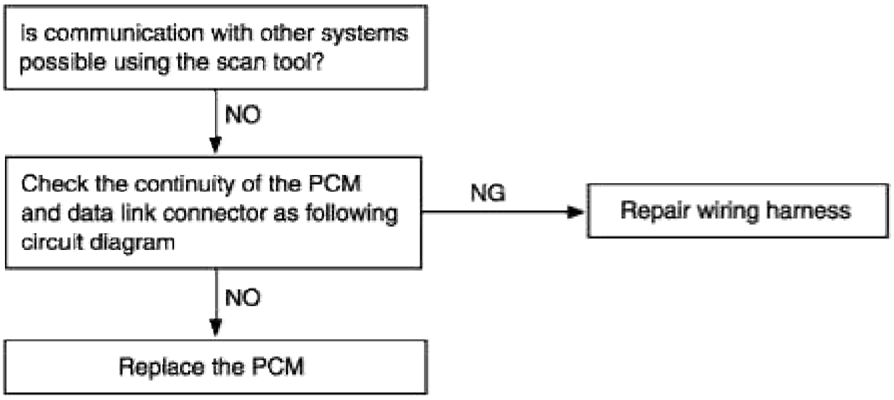
DTC NO	Description	Fail-safe	Note (Relation to diagnostic trouble code)
P0717	Open-circuited pulse generator A	Locked in third (D) or second (2, L) gear	When code P0717 is generated fourth time
P0722	Open-circuited pulse generator B	Locked in third (D) or second (2,L) gear	When code P0722 is generated fourth time
P0750	Open-circuited or shorted shift control solenoid valve A	Lock in third gear	When code P0750 is generated fourth time
P0755	Open-circuited or shorted shift control solenoid valve B	Lock in third gear	When code P0755 is generated fourth time
P0760	Open-circuited or shorted shift control solenoid valve C	Lock in third gear	When code P0760 is generated fourth time
P0745 P0775	Open-circuited shorted pressure control solenoid valve	Lock in third (D) or second (2,L)	When codes P0745 or P0775 are generated fourth time
P0731 P0732 P0733 P0734	Gear shifting does not match the engine speed	Lock in third (D) or second (2,L)	When either codes P0731, P0732, P0733 or P0734 are generated fourth time

INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom		Inspection procedure No.	Reference page
Communication with scan tool is not possible		1	TR-18
Driving impossible	Starting impossible (will not crank)	2	TR-19
	Does not move forward	3	TR-20
	Does not back-up	4	TR-21
	Does not move (forward or reverse)	5	TR-22
Malfunction when starting	Engine stalling during shifting	6	TR-23
	Shocks when shifting from N to D and long lag time	7	TR-24
	Shocks when shifting from N to R and long lag time	8	TR-25
	Shocks when shifting from N to D, N to R and long lag	9	TR-26
Malfunction when shifting	Shocks and flare shifts	10	TR-27
Early, late shift points	All points	11	TR-28
	Some points	12	TR-29
Does not shift	Does not shift	13	TR-30
Malfunction while driving	Poor acceleration	14	TR-31
	Vibration	15	TR-32
	Overdrive switch system	16	TR-33

INSPECTION PROCEDURE 1

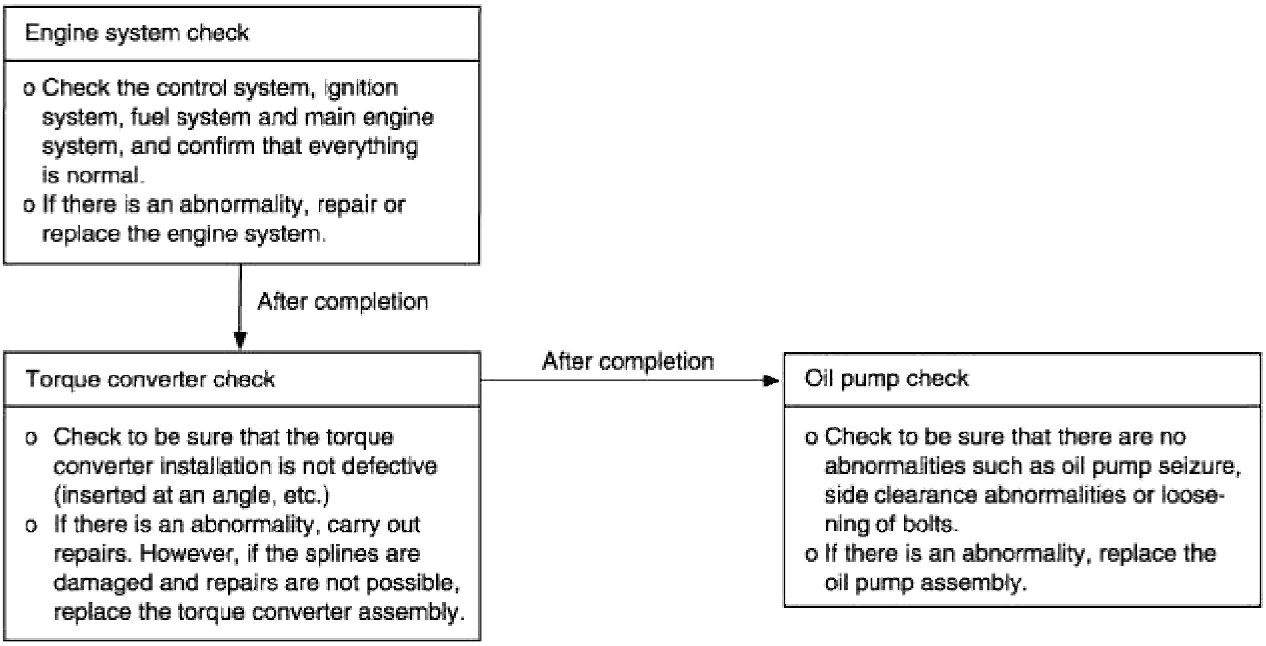
Communication with scan tool is not possible	Possible cause
If communiction with the scan tool is not possible, the cause may be a defective diagnosis line or PCM is not functioning	• Malfunction of diagnosis line • Malfunction of PCM power • Malfunction of PCM ground circuit • Malfunction of PCM


Is communication with other systems possible using the scan tool?
NO
Check the continuity of the PCM and data link connector as following circuit diagram
NG
Repair wiring harness
NO
Replace the PCM

tomsn048@gmail.com

INSPECTION PROCEDURE 2

Starting Impossible (will not crank)	Possible cause
Starting is not possible when the selector lever is in P or N range. In such cases, the cause may be a defective engine system, torque converter or oil pump.	• Malfunction of the engine system • Malfunction of the oil pump • Malfunction of the torque converter



Engine system check

- o Check the control system, ignition system, fuel system and main engine system, and confirm that everything is normal.
- o If there is an abnormality, repair or replace the engine system.

Torque converter check

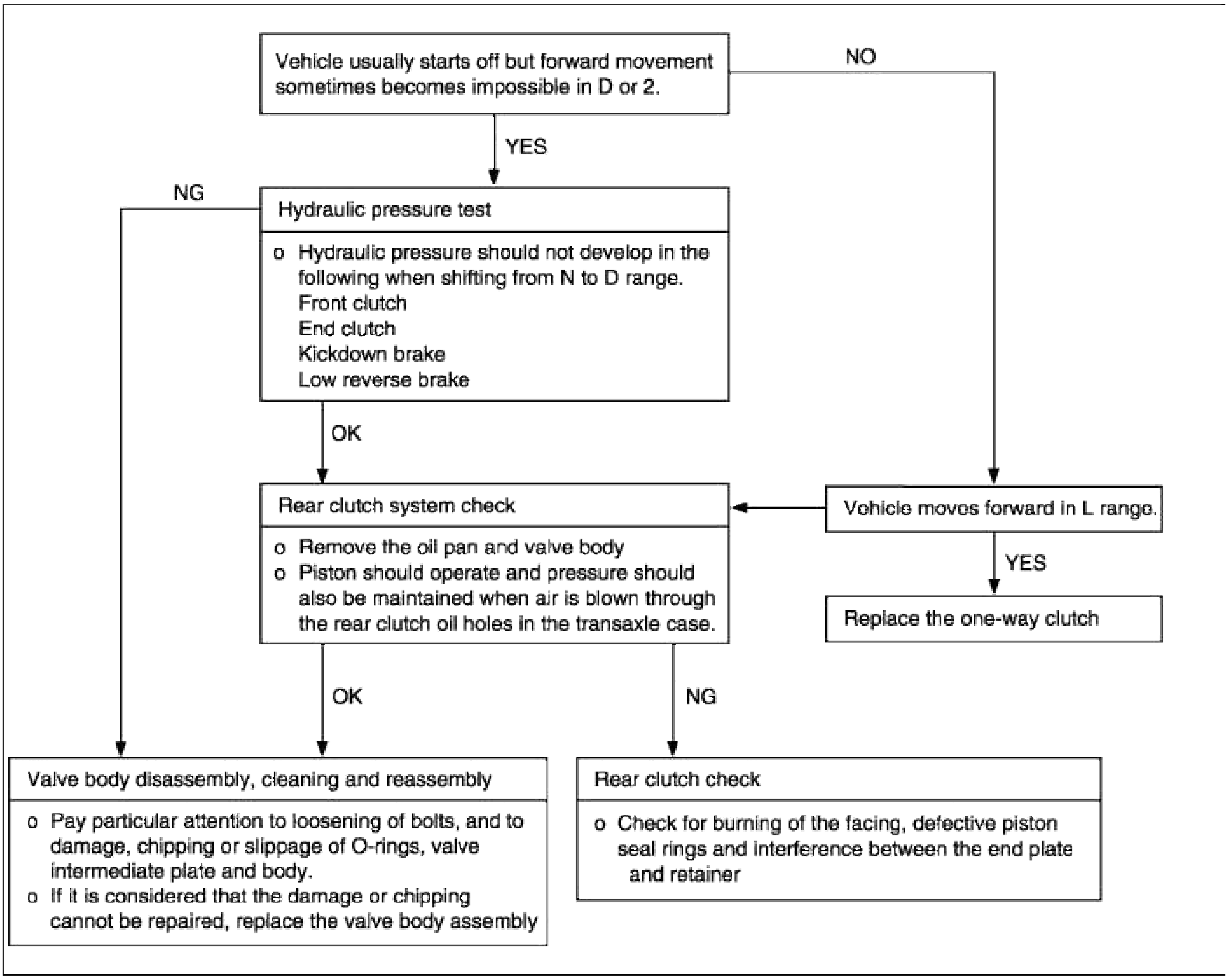
- o Check to be sure that the torque converter installation is not defective (inserted at an angle, etc.)
- o If there is an abnormality, carry out repairs. However, if the splines are damaged and repairs are not possible, replace the torque converter assembly.

Oil pump check

- o Check to be sure that there are no abnormalities such as oil pump seizure, side clearance abnormalities or loosening of bolts.
- o If there is an abnormality, replace the oil pump assembly.

INSPECTION PROCEDURE 3

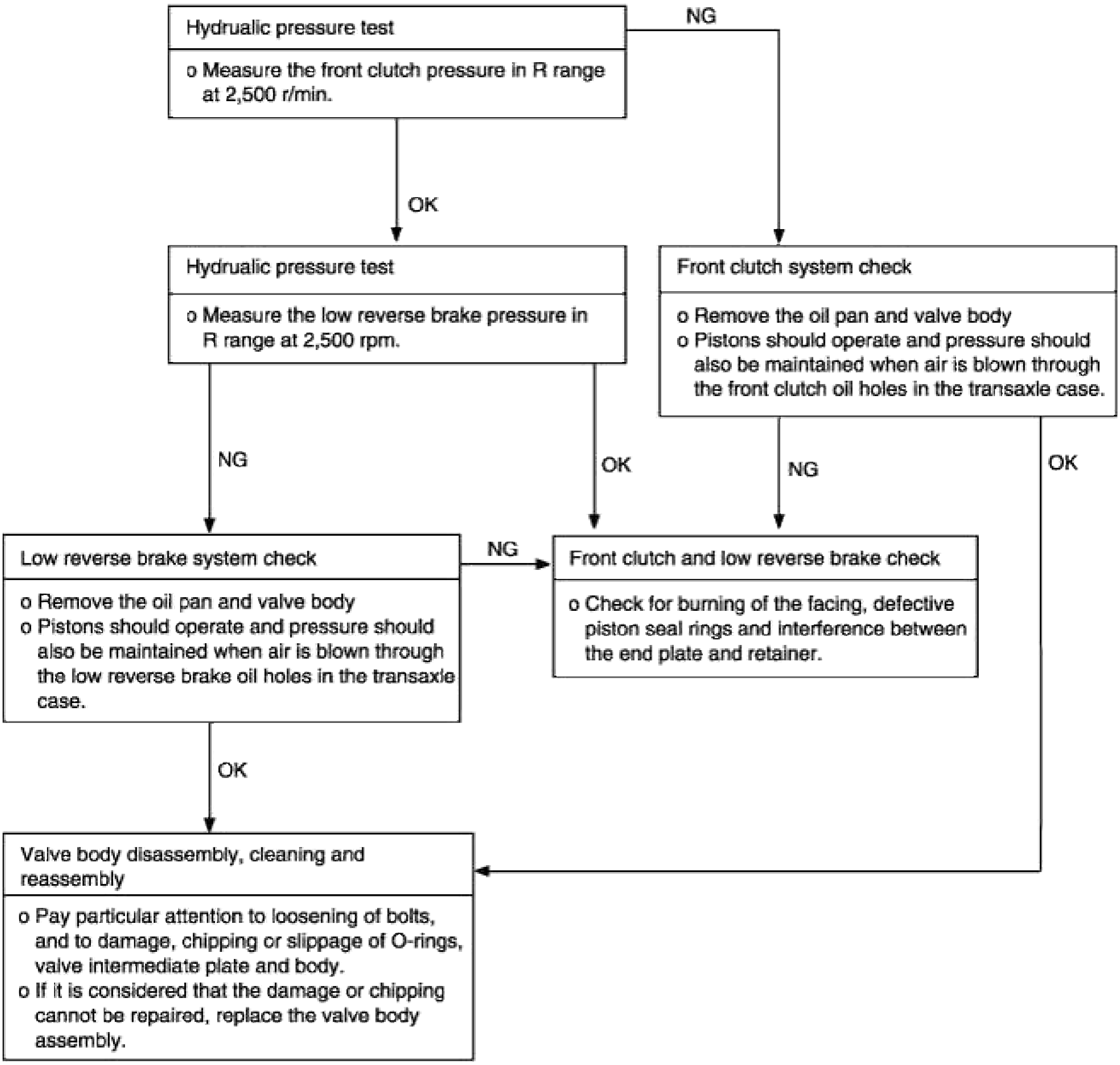
Does not move forward	Possible cause
When the engine is idling, the vehicle does not move forward even if the selector lever is shifted from N to D, 2 or L range. In such cases, the cause may be abnormal line pressure; a defective rear clutch or a one-way clutch.	• Abnormal line pressure • Malfunction of rear clutch • Malfunction of one-way clutch • Malfunction of valve body


Vehicle usually starts off but forward movement sometimes becomes impossible in D or 2.
NO
YES
NG
Hydraulic pressure test
o Hydraulic pressure should not develop in the following when shifting from N to D range.
Front clutch
End clutch
Kickdown brake
Low reverse brake
OK
Rear clutch system check
o Remove the oil pan and valve body
o Piston should operate and pressure should also be maintained when air is blown through the rear clutch oil holes in the transaxle case.
Vehicle moves forward in L range.
YES
Replace the one-way clutch
OK
NG
Valve body disassembly, cleaning and reassembly
o Pay particular attention to loosening of bolts, and to damage, chipping or slippage of O-rings, valve intermediate plate and body.
o If it is considered that the damage or chipping cannot be repaired, replace the valve body assembly
Rear clutch check
o Check for burning of the facing, defective piston seal rings and interference between the end plate and retainer

INSPECTION PROCEDURE 4

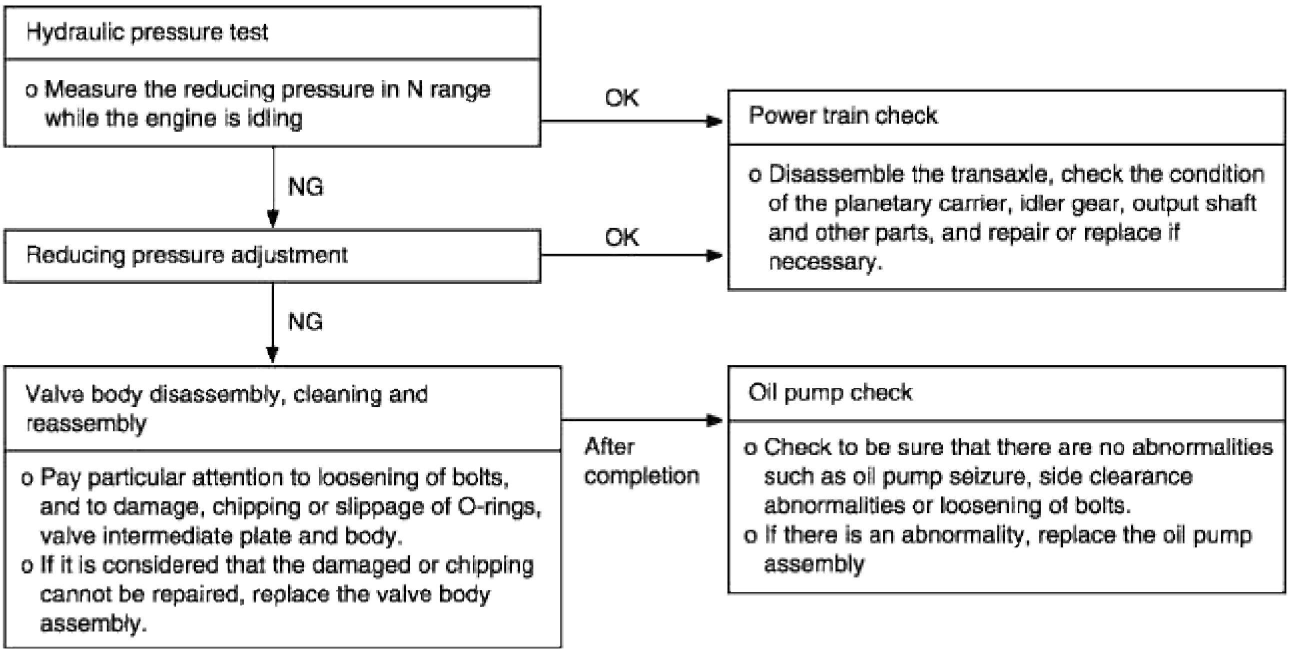
Does not move back-up	Possible cause
When the engine is idling, the vehicle does not back-up even if the selector lever is shifted from N to R range. In such cases, the cause may be abnormal pressure in the low reverse brake or front clutch, or a defective low reverse brake or front clutch.	• Abnormal low reverse brake pressure • Abnormal front clutch pressure • Malfunction of front clutch • Malfunction of low reverse brake • Malfunction of valve body

tomsn048@gmail.com


Hydrualic pressure test
o Measure the front clutch pressure in R range at 2,500 r/min.
NG
OK
Hydrualic pressure test
o Measure the low reverse brake pressure in R range at 2,500 rpm.
Front clutch system check
o Remove the oil pan and valve body
o Pistons should operate and pressure should also be maintained when air is blown through the front clutch oil holes in the transaxle case.
NG
OK
NG
OK
Low reverse brake system check
o Remove the oil pan and valve body
o Pistons should operate and pressure should also be maintained when air is blown through the low reverse brake oil holes in the transaxle case.
NG
Front clutch and low reverse brake check
o Check for burning of the facing, defective piston seal rings and interference between the end plate and retainer.
OK
Valve body disassembly, cleaning and reassembly
o Pay particular attention to loosening of bolts, and to damage, chipping or slippage of O-rings, valve intermediate plate and body.
o If it is considered that the damage or chipping cannot be repaired, replace the valve body assembly.

INSPECTION PROCEDURE 5

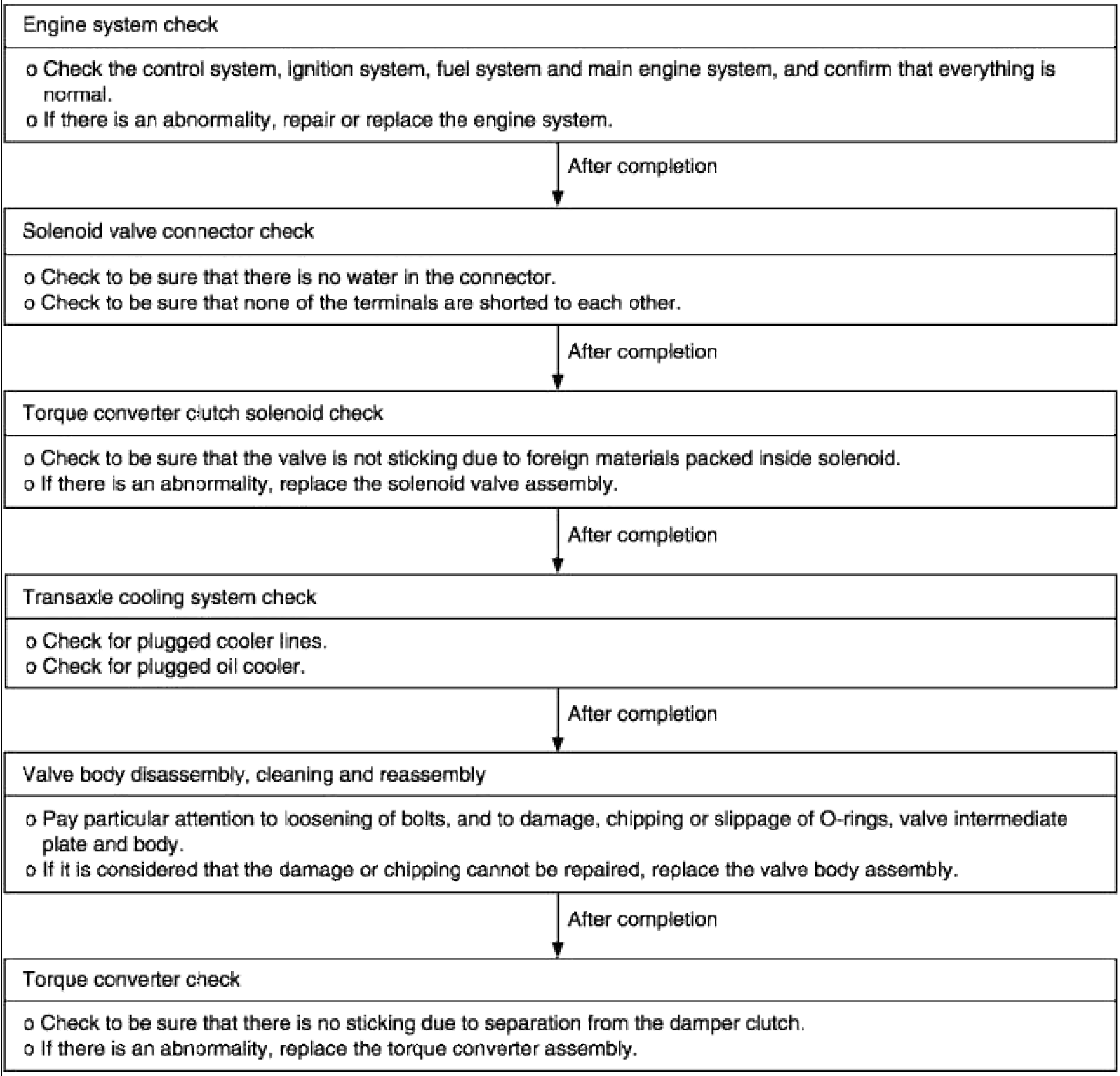
Does not move (forward or reverse)	Possible cause
When the engine is idling, the vehicle does not move forward or reverse even if the selector lever is shifted from N to D, 2, L or R range. In such cases, the cause may be abnormal reducing pressure, or a defective oil pump or power train.	• Abnormal reducing pressure • Malfunction of power train • Malfunctin of oil pump • Malfunction of valve body


Hydraulic pressure test
o Measure the reducing pressure in N range while the engine is idling
OK
Power train check
o Disassemble the transaxle, check the condition of the planetary carrier, idler gear, output shaft and other parts, and repair or replace if necessary.
NG
Reducing pressure adjustment
OK
NG
Valve body disassembly, cleaning and reassembly
o Pay particular attention to loosening of bolts, and to damage, chipping or slippage of O-rings, valve intermediate plate and body.
o If it is considered that the damaged or chipping cannot be repaired, replace the valve body assembly.
After completion
Oil pump check
o Check to be sure that there are no abnormalities such as oil pump seizure, side clearance abnormalities or loosening of bolts.
o If there is an abnormality, replace the oil pump assembly

INSPECTION PROCEDURE 6

Engine stalling during shifting	**Possible cause**
When the engine is idling, the engine stalls when the selector lever is shifted from N to D, 2, L or R range. In such cases, the cause may be a defective engine system or damper clutch control solenoid valve.	• Malfunction of engine system • Malfunction of torque converter clutch solenoid • Malfunction of valve body • Malfunction of torque converter

tomsn048@gmail.com



Engine system check

- Check the control system, ignition system, fuel system and main engine system, and confirm that everything is normal.
- If there is an abnormality, repair or replace the engine system.

After completion

Solenoid valve connector check

- Check to be sure that there is no water in the connector.
- Check to be sure that none of the terminals are shorted to each other.

After completion

Torque converter clutch solenoid check

- Check to be sure that the valve is not sticking due to foreign materials packed inside solenoid.
- If there is an abnormality, replace the solenoid valve assembly.

After completion

Transaxle cooling system check

- Check for plugged cooler lines.
- Check for plugged oil cooler.

After completion

Valve body disassembly, cleaning and reassembly

- Pay particular attention to loosening of bolts, and to damage, chipping or slippage of O-rings, valve intermediate plate and body.
- If it is considered that the damage or chipping cannot be repaired, replace the valve body assembly.

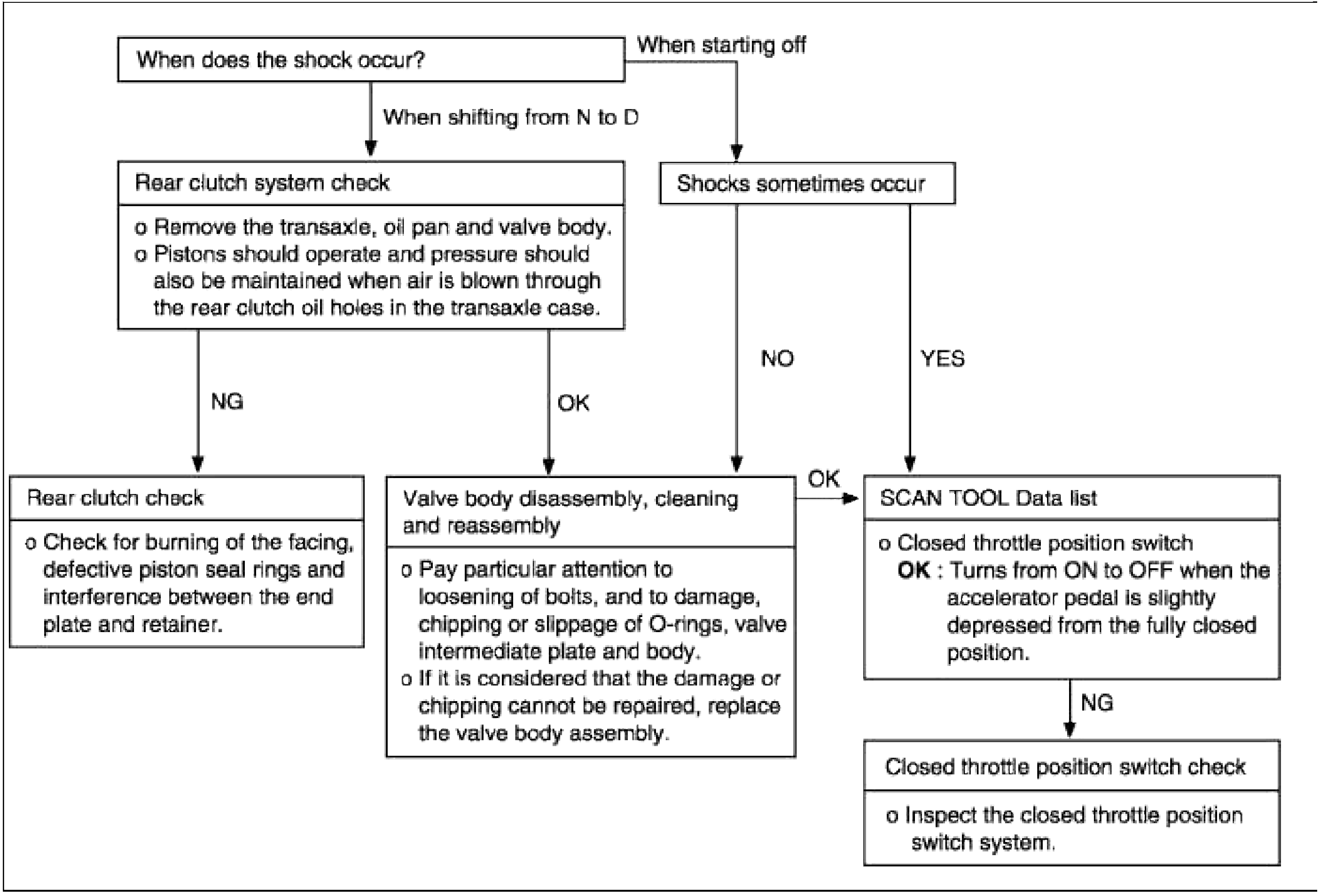
After completion

Torque converter check

- Check to be sure that there is no sticking due to separation from the damper clutch.
- If there is an abnormality, replace the torque converter assembly.

INSPECTION PROCEDURE 7

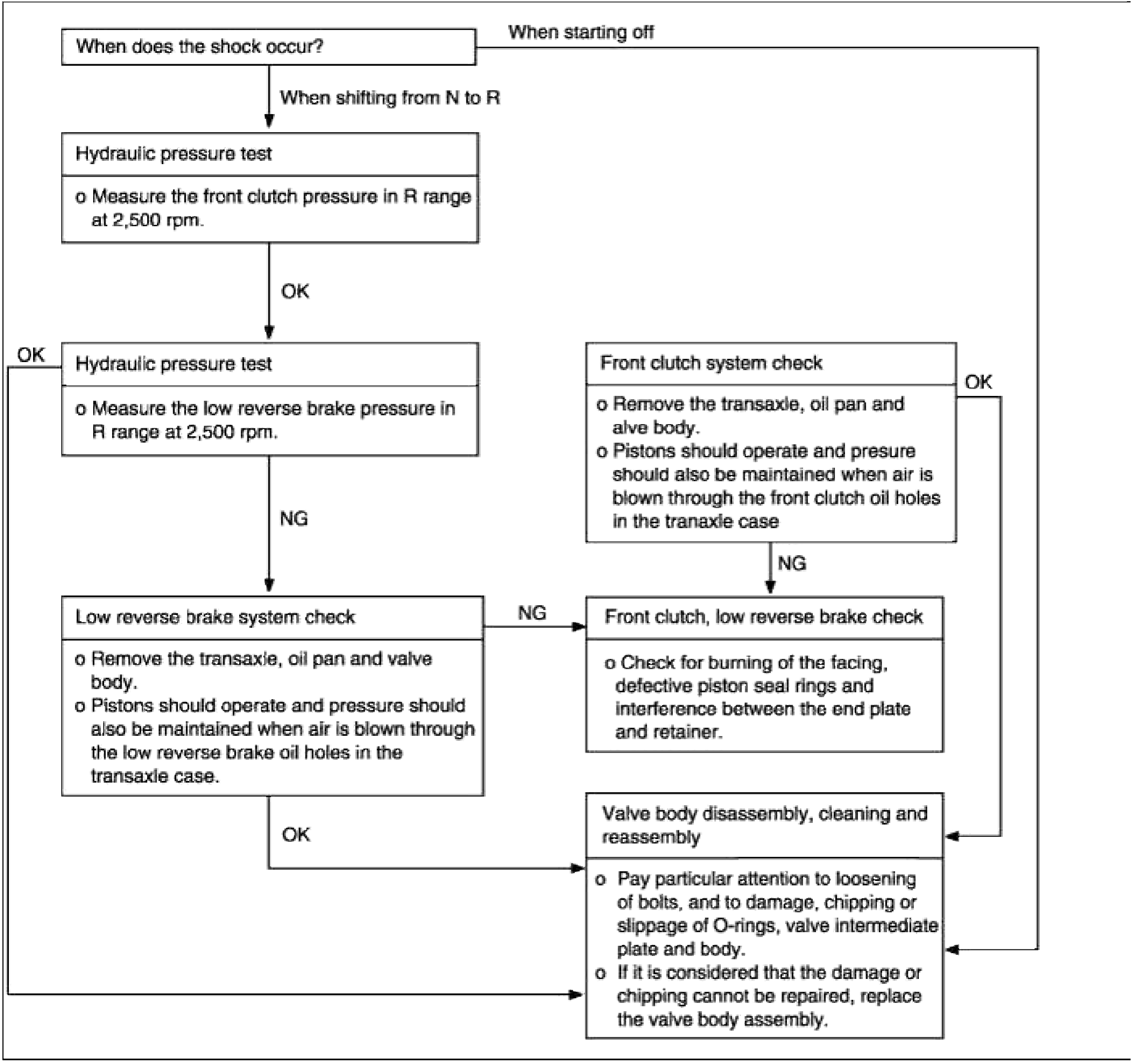
Shocks when shifting from N to D and long lag time	Possible cause
When the engine is idling, abnormal shocks or a lag time of 2 seconds or more occur when the selector lever is shifted from N to D range. In such case, the cause may be a defective rear clutch or valve body.	• Malfunction of rear clutch • Malfunction of valve body • Malfunction of closed throttle position switch


When does the shock occur?
When starting off
When shifting from N to D
Rear clutch system check
o Remove the transaxle, oil pan and valve body.
o Pistons should operate and pressure should also be maintained when air is blown through the rear clutch oil holes in the transaxle case.
Shocks sometimes occur
NG
OK
NO
YES
Rear clutch check
o Check for burning of the facing, defective piston seal rings and interference between the end plate and retainer.
Valve body disassembly, cleaning and reassembly
o Pay particular attention to loosening of bolts, and to damage, chipping or slippage of O-rings, valve intermediate plate and body.
o If it is considered that the damage or chipping cannot be repaired, replace the valve body assembly.
OK
SCAN TOOL Data list
o Closed throttle position switch
OK : Turns from ON to OFF when the accelerator pedal is slightly depressed from the fully closed position.
NG
Closed throttle position switch check
o Inspect the closed throttle position switch system.

INSPECTION PROCEDURE 8

Shocks when shifting from N to R and long lag time	Possible cause
When the engine is idling, abnormal shocks or a lag time of 2 seconds or more occurs when the selector lever is shifted from N to R range. In such cases, the cause may be abnormal low reverse brake or front clutch pressure, or a defective low reverse brake or front clutch.	• Abnormal front clutch pressure • Abnormal low reverse brake pressure • Malfunction of front clutch • Malfunction of low reverse brake • Malfuntion of valve body

tomsn048@gmail.com



When does the shock occur?

Hydraulic pressure test

o Measure the front clutch pressure in R range at 2,500 rpm.

Hydraulic pressure test

o Measure the low reverse brake pressure in R range at 2,500 rpm.

Front clutch system check

o Remove the transaxle, oil pan and alve body.

o Pistons should operate and presure should also be maintained when air is blown through the front clutch oil holes in the tranaxle case

Low reverse brake system check

o Remove the transaxle, oil pan and valve body.

o Pistons should operate and pressure should also be maintained when air is blown through the low reverse brake oil holes in the transaxle case.

Front clutch, low reverse brake check

o Check for burning of the facing, defective piston seal rings and interference between the end plate and retainer.

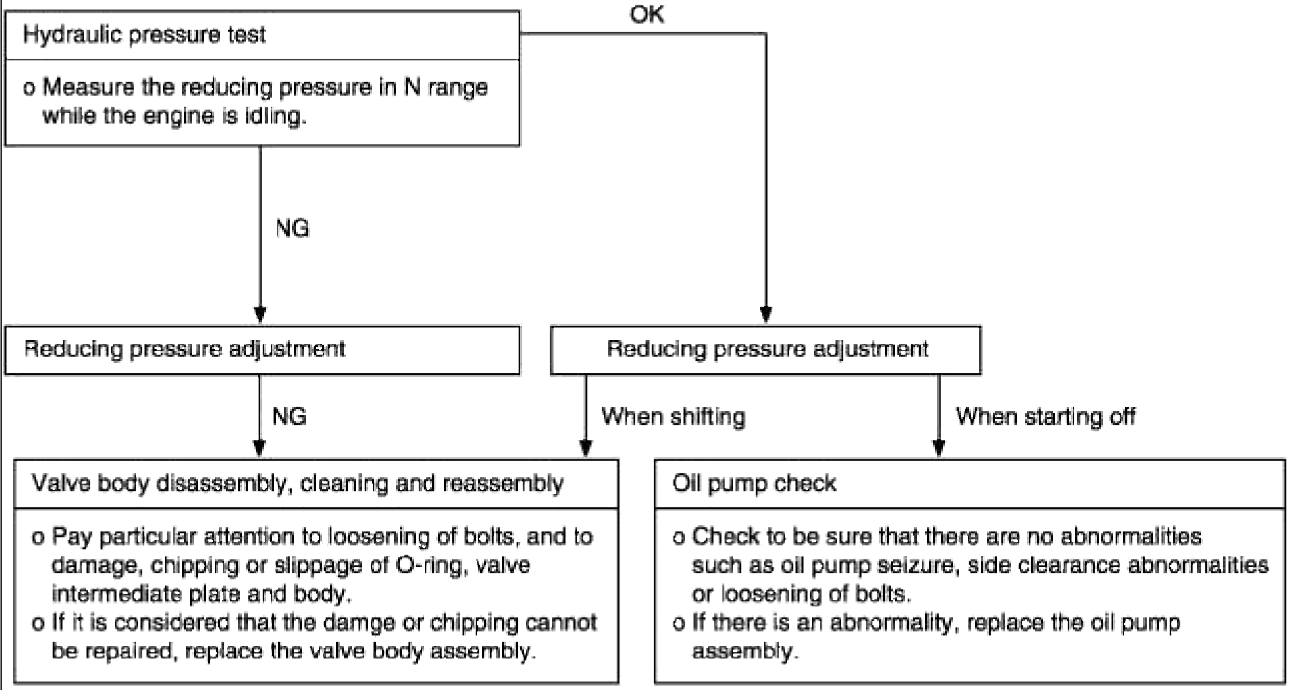
Valve body disassembly, cleaning and reassembly

o Pay particular attention to loosening of bolts, and to damage, chipping or slippage of O-rings, valve intermediate plate and body.

o If it is considered that the damage or chipping cannot be repaired, replace the valve body assembly.

INSPECTION PROCEDURE 9

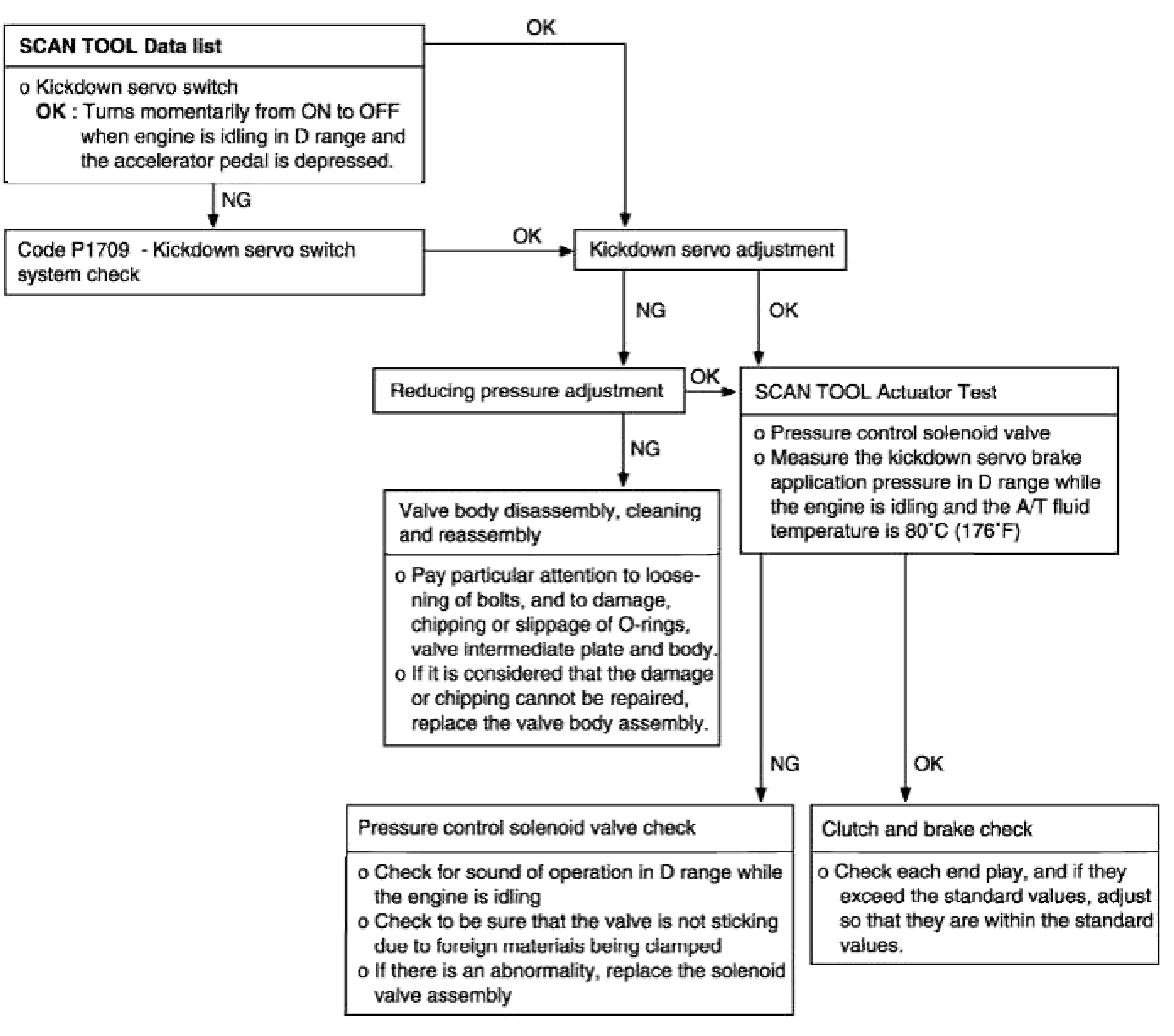
Shocks when shifting from N to D,N to R and long lag time	Possible cause
When the engine is idling, abnormal shocks or a lag time of 2 seconds or more occur when the selector lever is shifted from N to D range and from N to R range. In such cases, the cause may be abnormal reducing pressure or a defective oil pump.	• Abnormal reducing pressure • Malfunction of oil pump • Malfunction of valve body


Hydraulic pressure test
o Measure the reducing pressure in N range while the engine is idling.
OK
NG
Reducing pressure adjustment
Reducing pressure adjustment
NG
When shifting
When starting off
Valve body disassembly, cleaning and reassembly
o Pay particular attention to loosening of bolts, and to damage, chipping or slippage of O-ring, valve intermediate plate and body.
o If it is considered that the damge or chipping cannot be repaired, replace the valve body assembly.
Oil pump check
o Check to be sure that there are no abnormalities such as oil pump seizure, side clearance abnormalities or loosening of bolts.
o If there is an abnormality, replace the oil pump assembly.

INSPECTION PROCEDURE 10

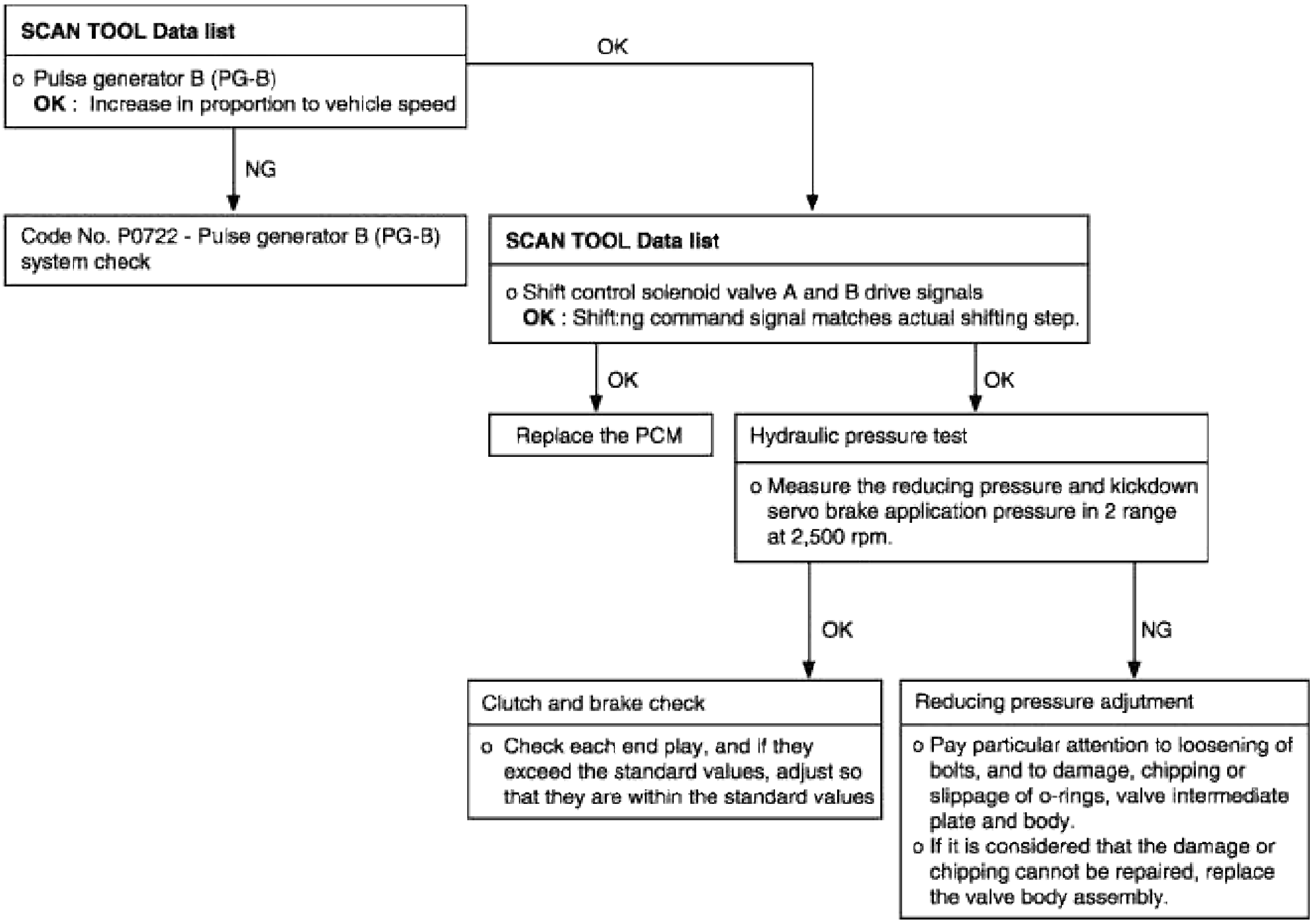
Shocks and flare shifts	Probable cause
Shocks occur when driving due to upshifting or downshifting. In addition,the engine speed during shifting increases abnormally in comparison to normal shifting. In such cases, the cause is probably abnormal reducing pressure or a defective kickdown servo switch.	• Malfunction of kickdown servo switch • Abnormal reducing pressure • Malfunction of valve body • Malfunction of closed throttle position switch • Malfunction of pressure control solenoid valve • Malfunction of clutches and brakes

tomsn048@gmail.com


SCAN TOOL Data list
o Kickdown servo switch
OK : Turns momentarily from ON to OFF when engine is idling in D range and the accelerator pedal is depressed.
OK
NG
Code P1709 - Kickdown servo switch system check
OK
Kickdown servo adjustment
NG
OK
Reducing pressure adjustment
OK
SCAN TOOL Actuator Test
o Pressure control solenoid valve
o Measure the kickdown servo brake application pressure in D range while the engine is idling and the A/T fluid temperature is 80°C (176°F)
NG
Valve body disassembly, cleaning and reassembly
o Pay particular attention to loosening of bolts, and to damage, chipping or slippage of O-rings, valve intermediate plate and body.
o If it is considered that the damage or chipping cannot be repaired, replace the valve body assembly.
NG
OK
Pressure control solenoid valve check
o Check for sound of operation in D range while the engine is idling
o Check to be sure that the valve is not sticking due to foreign materials being clamped
o If there is an abnormality, replace the solenoid valve assembly
Clutch and brake check
o Check each end play, and if they exceed the standard values, adjust so that they are within the standard values.

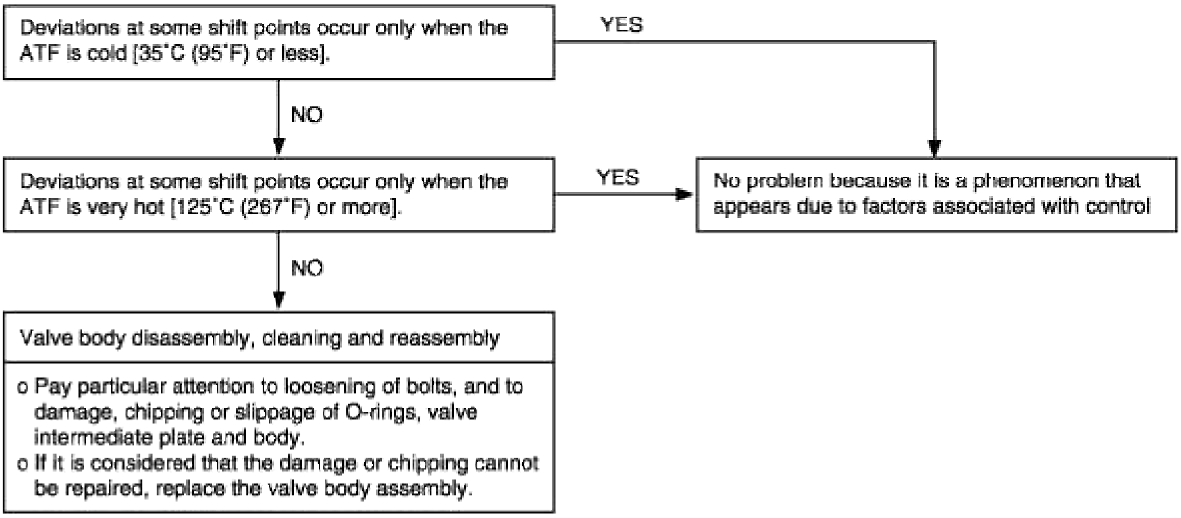
INSPECTION PROCEDURE 11

All points (Early, late shifting points)	Possible cause
All shift points occurs early, late while driving. In such cases, the cause may be a defective pulse generator B (PG-B) or shift control solenoid valve A or B (SCSV-A, B).	• Malfunction of pulse generator B (PG-B) • Malfunction of shift control solenoid valve A or B (SCSV-A, B) • Malfunction of PCM • Abnormal reducing pressure or kickdown servo brake application pressure • Malfunction of clutches and brake


SCAN TOOL Data list
o Pulse generator B (PG-B)
OK : Increase in proportion to vehicle speed
OK
NG
Code No. P0722 - Pulse generator B (PG-B) system check
SCAN TOOL Data list
o Shift control solenoid valve A and B drive signals
OK : Shifting command signal matches actual shifting step.
OK
OK
Replace the PCM
Hydraulic pressure test
o Measure the reducing pressure and kickdown servo brake application pressure in 2 range at 2,500 rpm.
OK
NG
Clutch and brake check
o Check each end play, and if they exceed the standard values, adjust so that they are within the standard values
Reducing pressure adjutment
o Pay particular attention to loosening of bolts, and to damage, chipping or slippage of o-rings, valve intermediate plate and body.
o If it is considered that the damage or chipping cannot be repaired, replace the valve body assembly.

INSPECTION PROCEDURE 12

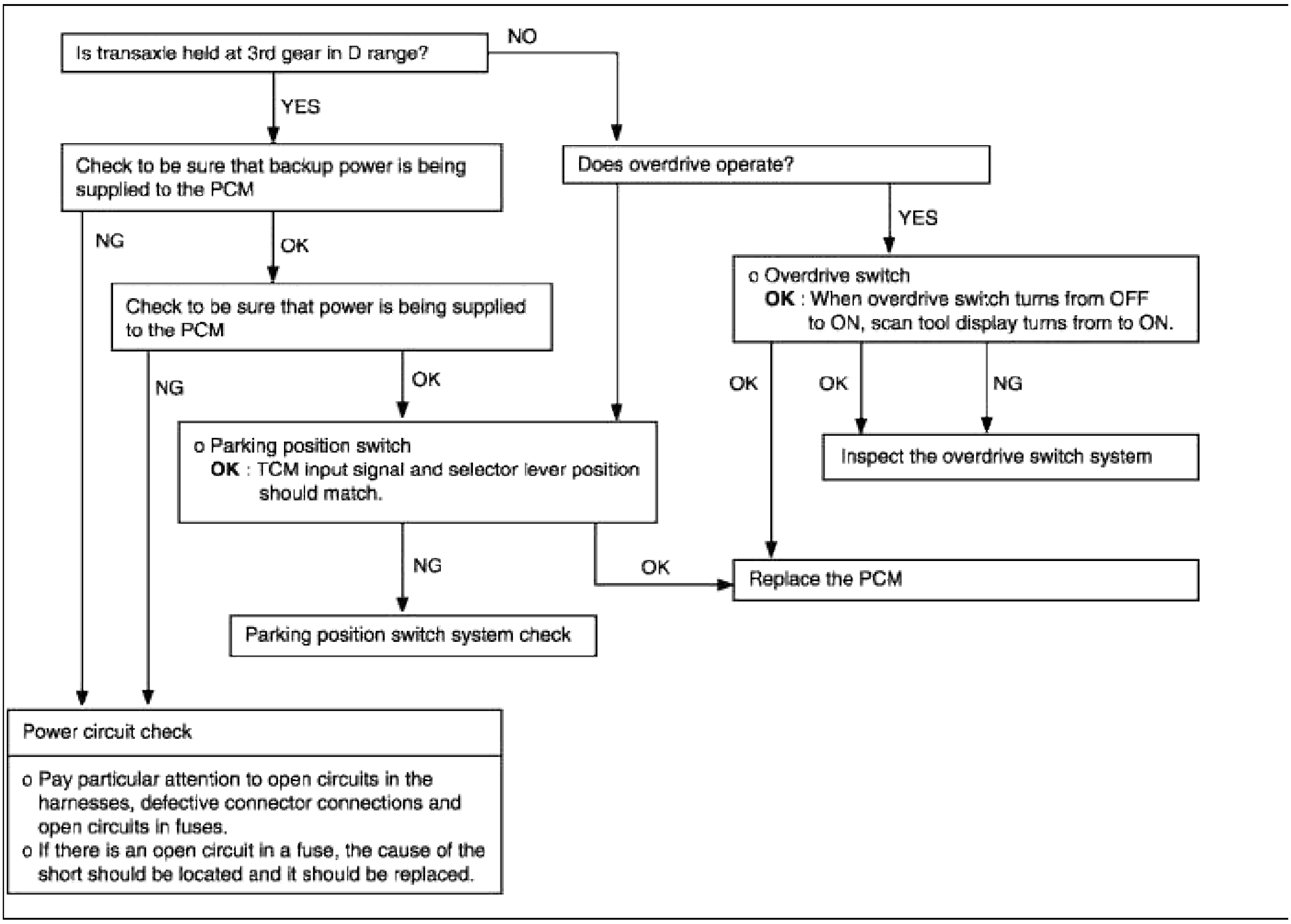
Some points (Early, late shifting points)	Possible cause
Some shift points occurs early, late while driving. In such cases, the cause may be a defective valve body, or it is phenomenon related to control and is not an abnormality.	• Malfunction of valve body


Deviations at some shift points occur only when the ATF is cold [35°C (95°F) or less].
YES
NO
Deviations at some shift points occur only when the ATF is very hot [125°C (267°F) or more].
YES
No problem because it is a phenomenon that appears due to factors associated with control
NO
Valve body disassembly, cleaning and reassembly
o Pay particular attention to loosening of bolts, and to damage, chipping or slippage of O-rings, valve intermediate plate and body.
o If it is considered that the damage or chipping cannot be repaired, replace the valve body assembly.

INSPECTION PROCEDURE 13

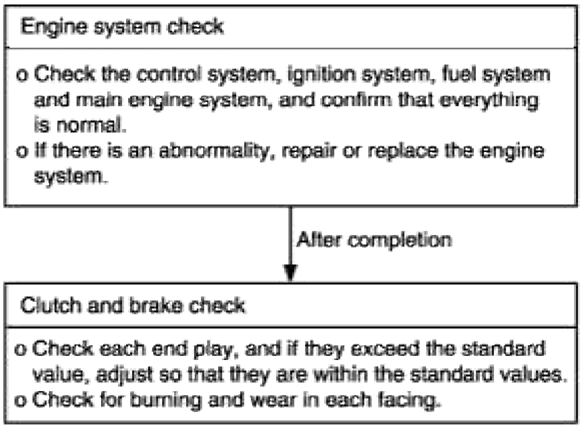
tomsn048@gmail.com

Does not shift	Possible cause
Shifting does not occur while driving, and no fail-safe codes are output. In such cases, the cause may be a defective overdrive switch or parking switch.	• Malfunction of overdrive switch • Malfunction of parking position switch • Malfunction of power supply circuit • Malfunction of PCM


Is transaxle held at 3rd gear in D range?
NO
YES
Check to be sure that backup power is being supplied to the PCM
NG
OK
Does overdrive operate?
YES
o Overdrive switch
OK : When overdrive switch turns from OFF to ON, scan tool display turns from to ON.
Check to be sure that power is being supplied to the PCM
NG
OK
OK
OK
NG
o Parking position switch
OK : TCM input signal and selector lever position should match.
Inspect the overdrive switch system
NG
OK
Replace the PCM
Parking position switch system check
Power circuit check
o Pay particular attention to open circuits in the harnesses, defective connector connections and open circuits in fuses.
o If there is an open circuit in a fuse, the cause of the short should be located and it should be replaced.

INSPECTION PROCEDURE 14

Poor acceleration	Possible cause
While driving, acceleration is poor even if downshifting is performed. In such cases, the cause may be a defective clutch, brake or a defective engine system.	• Malfunction of clutch and brakes • Malfunction of engine system



Engine system check

o Check the control system, ignition system, fuel system and main engine system, and confirm that everything is normal.

o If there is an abnormality, repair or replace the engine system.

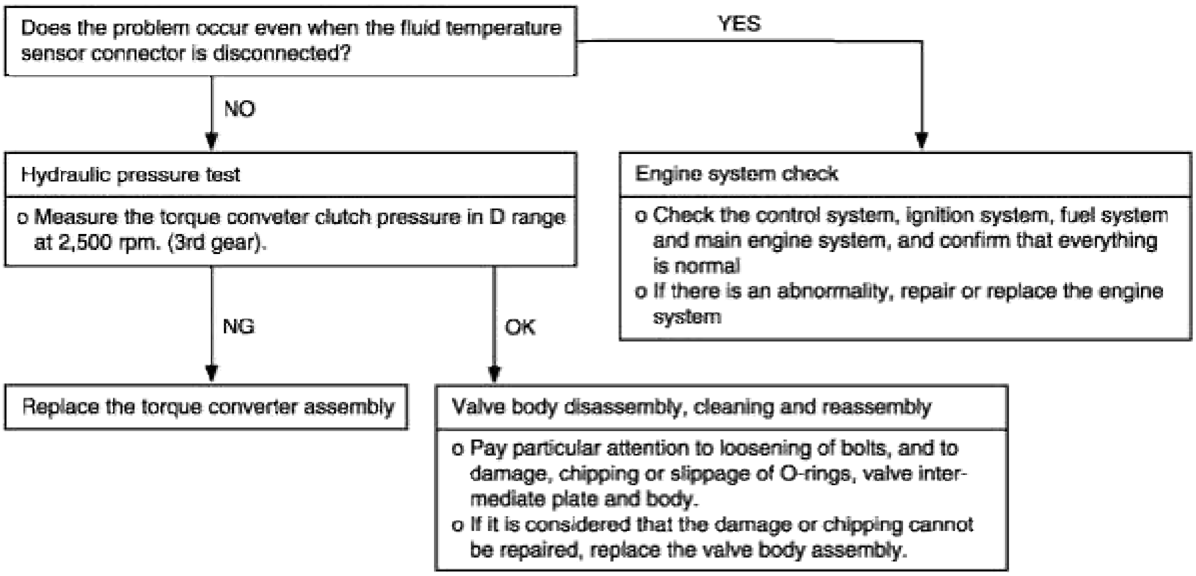
Clutch and brake check

o Check each end play, and if they exceed the standard value, adjust so that they are within the standard values.

o Check for burning and wear in each facing.

INSPECTION PROCEDURE 15

Vibration	Possible cause
Vibration occurs when driving at constant speed or when accelerating in top range. In such case, the cause may be abnormal torque converter clutch pressure or a defective torque converter.	• Abnormal torque converter clutch pressure • Malfunction of engine system • Malfunction of torque converter • Malfunction of valve body



Does the problem occur even when the fluid temperature sensor connector is disconnected?

Hydraulic pressure test

o Measure the torque conveter clutch pressure in D range at 2,500 rpm. (3rd gear).

Engine system check

o Check the control system, ignition system, fuel system and main engine system, and confirm that everything is normal

o If there is an abnormality, repair or replace the engine system

Replace the torque converter assembly

Valve body disassembly, cleaning and reassembly

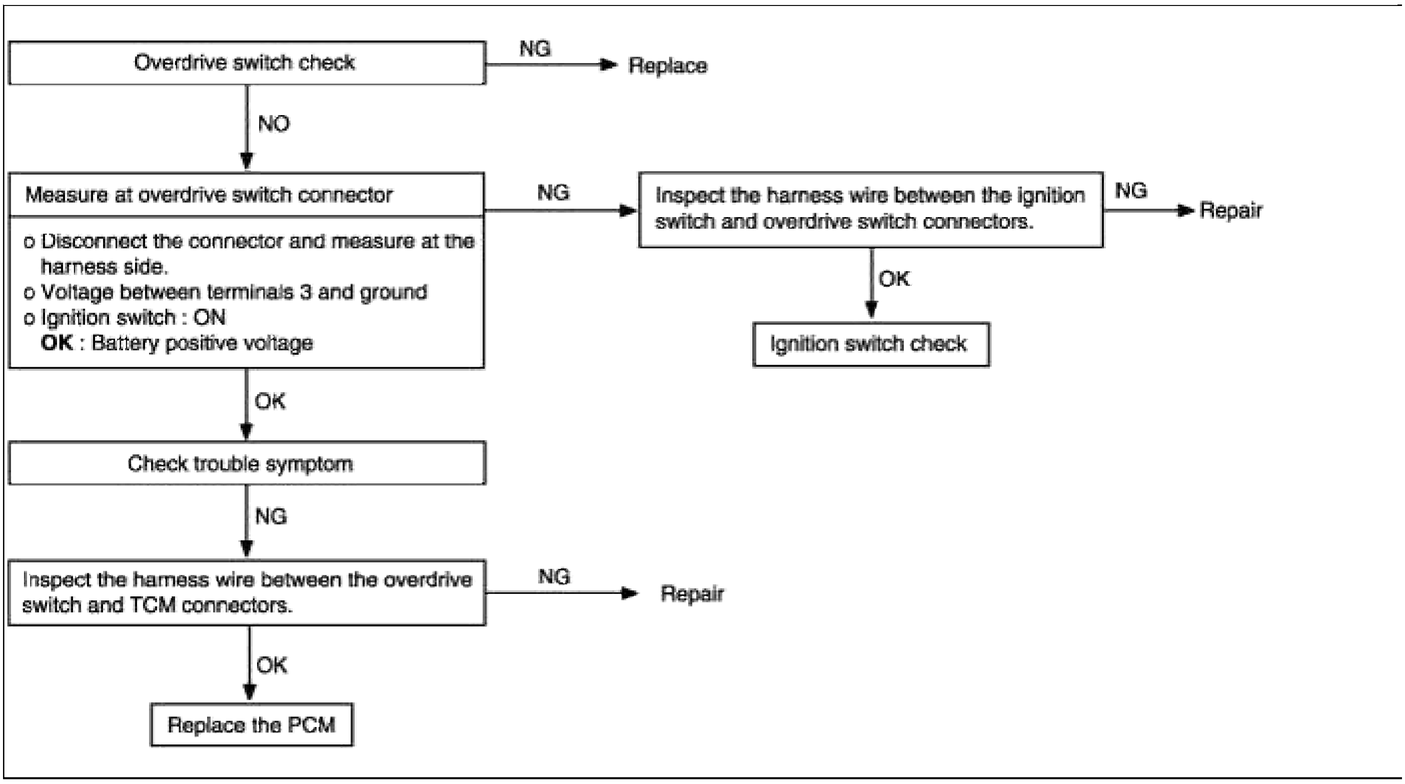
o Pay particular attention to loosening of bolts, and to damage, chipping or slippage of O-rings, valve intermediate plate and body.

o If it is considered that the damage or chipping cannot be repaired, replace the valve body assembly.

INSPECTION PROCEDURE 16

Overdrive switch system	Possible cause
In cases such as the above, the cause may be a defective overdrive switch circuit or defective ignition switch circuit.	• Malfunction of overdrive switch • Malfunction of connector • Malfunction of ignition switch • Malfunction of PCM

tomsn048@gmail.com


Overdrive switch check
NG
Replace
NO
Measure at overdrive switch connector
o Disconnect the connector and measure at the harness side.
o Voltage between terminals 3 and ground
o Ignition switch : ON
OK : Battery positive voltage
NG
Inspect the harness wire between the ignition switch and overdrive switch connectors.
NG
Repair
OK
Ignition switch check
OK
Check trouble symptom
NG
Inspect the harness wire between the overdrive switch and TCM connectors.
NG
Repair
OK
Replace the PCM

OBTAINING DIAGNOSTIC TROUBLE CODES

[USING HI-SCAN PRO]

1. Turn the ignition switch OFF.
2. Connect the Hi-Scan Pro to the data link connector.
3. Turn the ignition switch ON.
4. Use the Hi-Scan Pro to check the diagnostic trouble code.
5. Repair the faulty part from the diagnosis chart.
6. Erase the diagnostic trouble code.
7. Disconnect the Hi-Scan Pro.

MALFUNCTION INDICATOR LIGHT (MIL)

An on-board diagnostic light comes on to notify the driver that there is problems in the vehicle. However, when an irregular state returns to normal, the malfunction indicator light will go out automatically after 3 driving cycles that have no same fault. Immediately after the ignition switch is turned on, the malfunction indicator light operates normally. (See FL-section)

THE FOLLOWING ITEMS WILL BE INDICATED BY THE MIL

- Fluid temperature sensor
- Pulse generator A (PG-A)
- Pulse generator B (PG-B)
- Shift control solenoid valve A (SCSV-A)
- Shift control solenoid valve B (SCSV-B)
- Shift control solenoid valve C (SCSV-C)
- Pressure control solenoid valve (PCSV-A)
- Pressure control solenoid valve B (PCSV-B)
- Damper clutch solenoid valve (DCCSV)
- Shift stage synchronize
- Transaxle range switch

SERVICE DATA (WHEN A HI-SCAN PRO IS USED)

Diagnosis items	**Checking procedures**		**Checking items (Remedy)**
	Check conditions	**Normal value**	

Throttle position sensor (TPS)	Accelerator pedal fully released	2 ~ 18 %	• TPS or circuit harness if no change occurs • TPS or accelerator pedal cable if gradual change is not noted
	Press accelerator pedal slowly	Varies with accelerator opening	
	Accelerator pedal pressed to floor	80 ~ 100%	
Fluid temperature sensor	Cold engine (before starting)	Equivalent to outside air temperature	• Fluid temperature sensor or circuit harness
	While warming up engine	Gradual increase	
	After warming up engine	70 ~ 110°C	
Kickdown servo switch	L range : Idling	ON	• Kickdown servo misadjusted • Kickdown servo switch or circuit harness • Kickdown servo
	D range : First or third gear	ON	
	D range : Second or fourth gear	OFF	
Engine speed	P range : Idling Accelerator pedal : Fully closed	600 ~ 800rpm	• Ignition system • Ignition signal pick-up circuit harness
	P range : Idling Accelerator pedal : depressed		
Air conditioning relay signals	P range : Idle, air conditioning ON	ON	• Air conditioning power relay circuit harness
	P range : Idle, air conditioning OFF	OFF	
Shift position	1st speed : 10km/h	First	• PCM • Transaxle range switch system • TPS system
	2nd speed : 30km/h	Second	
	3rd speed : 50km/h	Third	
	4th speed : 80km/h	Fourth	
Pulse generator A	D range (OD OFF) : driving at 50 km/h (31 mph) in third gear	1,500 ~ 2,000rpm	• Pulse generator A or circuit harness • Pulse generator A shielded wire • Incoming noise from outside
	D range (OD ON) : driving at 80 km/h (50 mph) in fourth gear	1,700 ~ 2,000rpm	
Pulse generator B	D range (OD OFF) : driving at 50 km/h (31 mph) in third gear	1,500 ~ 2,000rpm	• Pulse generator B or circuit harness • Pulse generator B shielded wire • Incoming noise from outside
	D range (OD ON) : driving at 80 km/h (50 mph) in fourth gear	1,500 ~ 2,000rpm	
Overdrive switch	• Ignition switch : ON • Engine : stopped	OD-ON	• Overdrive switch or circuit harness

tomsn048@gmail.com

	• Overdrive switch is turned ON		
	• Ignition switch : ON • Engine : stopped • Overdrive switch is turned OFF	OD-OFF	
Transaxle range switch	Shift selector lever to P range	P	• Transaxle range switch misadjusted • Transaxle range switch or circuit harness • Manual control cable • If selector lever is inoperative, check shift lock mechanism
	Shift selector lever to R range	R	
	Shift selector lever to N range	N	
	Shift selector lever to D range	D	
	Shift selector lever to 2 range	2	
	Shift selector lever to L range	L	
Vehicle speed sensor	Keep vehicle stopped	0km/h	• Vehicle speed sensor if high speed signal is delivered while vehicle is stopping • In other cases, vehicle speed sensor or circuit harness
	Driving at 40 km/h (25 mph) in 2 range	40km/h (25 mph)	
	Driving at 50 km/h (31 mph) in D range, OD OFF	50km/h (31 mph)	
PCSV-A duty	D range : Idling	75 ~ 90%	• When accelerator pedal is slightly pressed while idling in D range, duty should become 100% • PCM • TPS system
	D range : first gear	100%	
PCSV-B duty	D range : Idling	0%	• PCM • TPS system
	D range : first gear	0%	
Torque converter slip amount	D range : third gear, 70km/h, OD OFF	0~50rpm	• Torque converter • Ignition signal wire or pulse generator A system • Inappropriate transaxle fluid pressure • Torque converter control solenoid valve
DCCSV duty	D range : third gear, 70km/h, OD OFF	40 ~ 85%	• PCM • TPS system

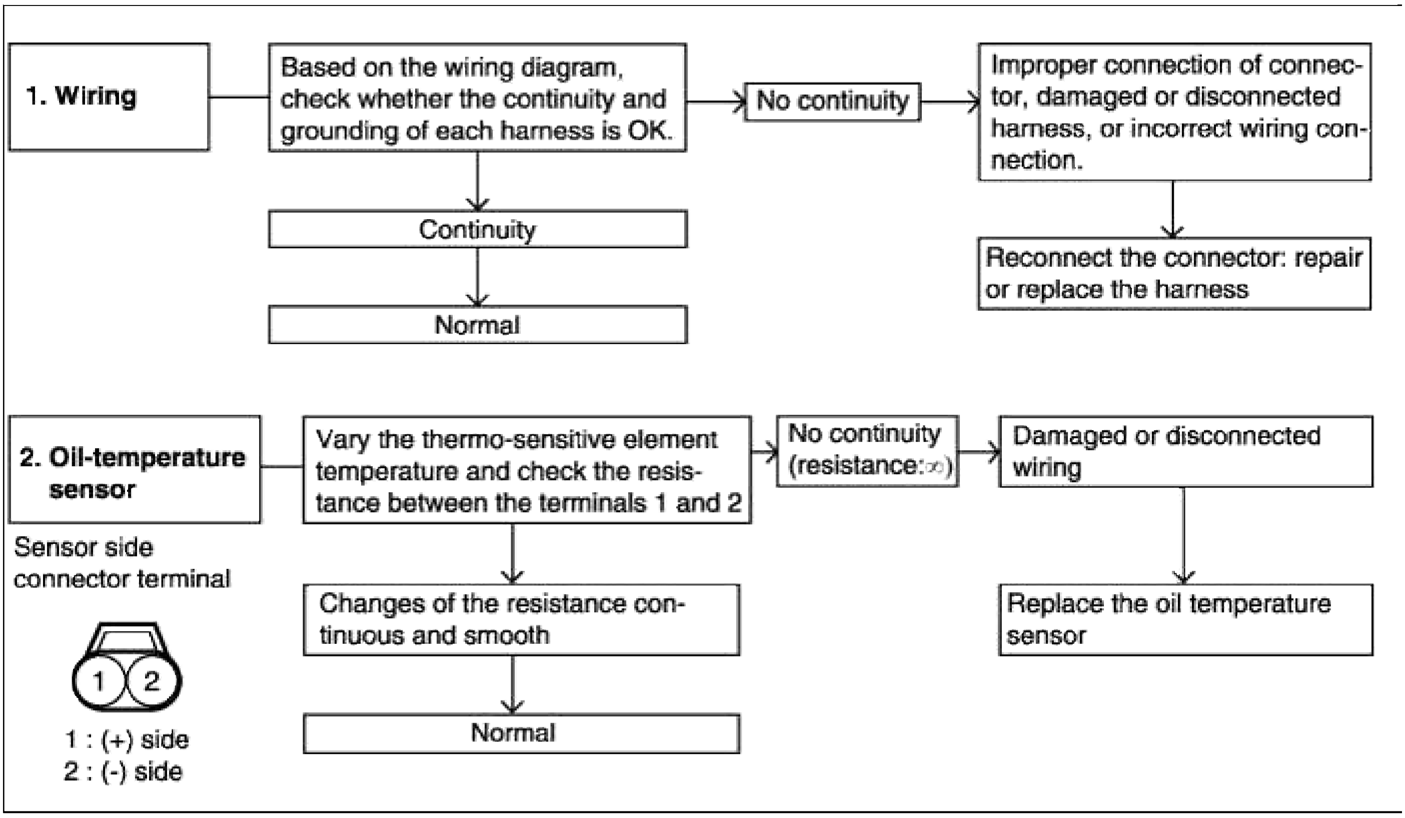
			• Pulse generator A system • Torque converter control solenoid valve

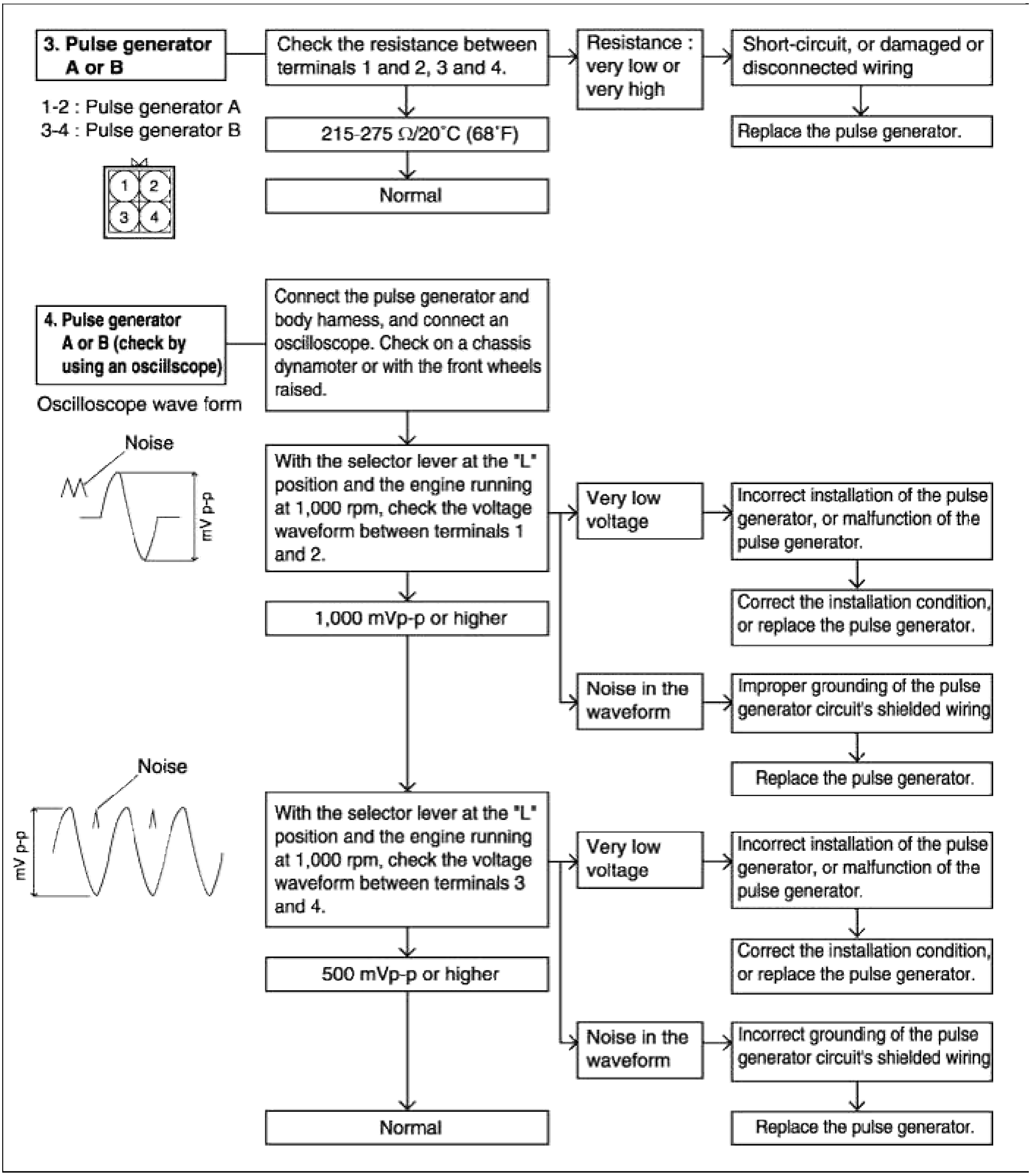
ELEMENTS IN USE IN EACH GEAR

Select or lever position	**Overdrive control switch**	**Shifting gear**	**Engine start**	**Parking Mechanism**	**Clutch**				**Brake**	
					C1	**C2**	**C3**	**OWC**	**B1**	**B2**
P	-	Neutral	Possible	O						
R	-	Reverse			O					O
N	-	Neutral	Possible							
D	ON	First				O		O		
		Second				O			O	
		Third			O	O	O			
		Fourth					O		O	
D	OFF	First				O		O		
		Second				O			O	
		Third			O	O	O			
2	-	First				O		O		
		Second				O			O	
L	-	First				O				O

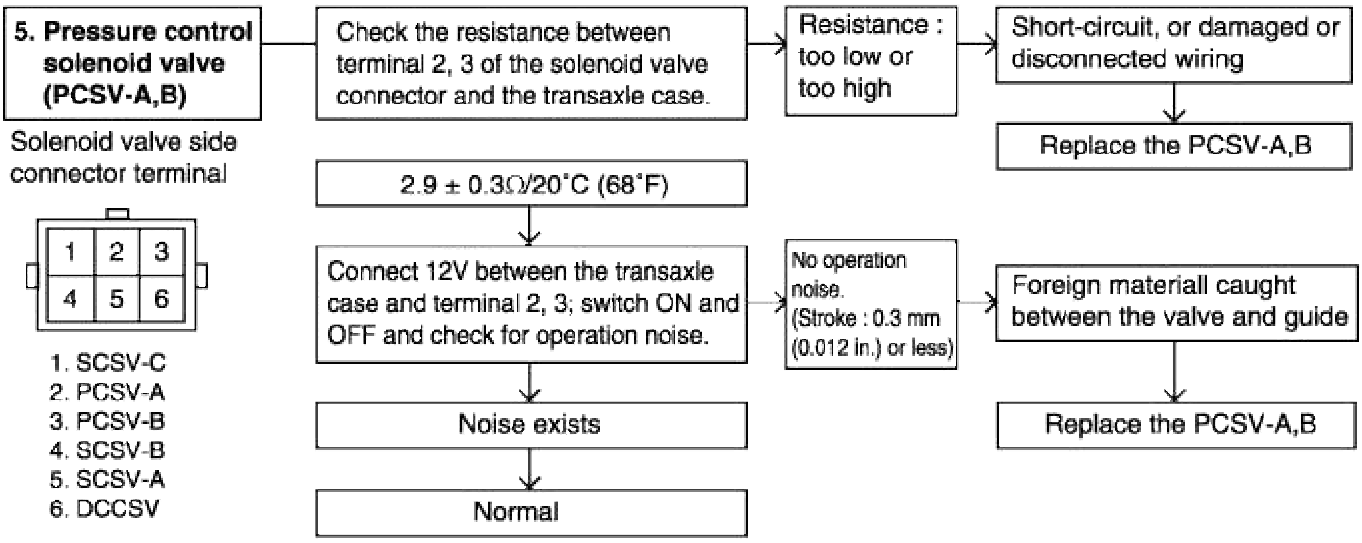
C1 : Front clutch
C2 : Rear clutch
C3 : End clutch
OWC : One way clutch
B1 : Kickdown brake
B2 : Low&reverse brake
INSPECTION OF ELECTRONIC CONTROL SYSTEM COMPONENTS

tomsn048@gmail.com


1. Wiring
Based on the wiring diagram, check whether the continuity and grounding of each harness is OK.
No continuity
Improper connection of connector, damaged or disconnected harness, or incorrect wiring connection.
Reconnect the connector: repair or replace the harness
Continuity
Normal
2. Oil-temperature sensor
Sensor side connector terminal
1
2
1 : (+) side
2 : (-) side
Vary the thermo-sensitive element temperature and check the resistance between the terminals 1 and 2
No continuity (resistance:∞)
Damaged or disconnected wiring
Replace the oil temperature sensor
Changes of the resistance continuous and smooth
Normal


3. Pulse generator A or B
1-2 : Pulse generator A
3-4 : Pulse generator B
1
2
3
4
Check the resistance between terminals 1 and 2, 3 and 4.
215-275 Ω/20˚C (68˚F)
Normal
Resistance : very low or very high
Short-circuit, or damaged or disconnected wiring
Replace the pulse generator.
4. Pulse generator A or B (check by using an oscillscope)
Oscilloscope wave form
Noise
mV p-p
Connect the pulse generator and body harness, and connect an oscilloscope. Check on a chassis dynamoter or with the front wheels raised.
With the selector lever at the "L" position and the engine running at 1,000 rpm, check the voltage waveform between terminals 1 and 2.
1,000 mVp-p or higher
Very low voltage
Incorrect installation of the pulse generator, or malfunction of the pulse generator.
Correct the installation condition, or replace the pulse generator.
Noise in the waveform
Improper grounding of the pulse generator circuit's shielded wiring
Replace the pulse generator.
Noise
mV p-p
With the selector lever at the "L" position and the engine running at 1,000 rpm, check the voltage waveform between terminals 3 and 4.
500 mVp-p or higher
Very low voltage
Incorrect installation of the pulse generator, or malfunction of the pulse generator.
Correct the installation condition, or replace the pulse generator.
Noise in the waveform
Incorrect grounding of the pulse generator circuit's shielded wiring
Replace the pulse generator.
Normal

tomsn048@gmail.com



5. Pressure control solenoid valve (PCSV-A,B)

Solenoid valve side connector terminal

1. SCSV-C
2. PCSV-A
3. PCSV-B
4. SCSV-B
5. SCSV-A
6. DCCSV

Check the resistance between terminal 2, 3 of the solenoid valve connector and the transaxle case.

Resistance : too low or too high → Short-circuit, or damaged or disconnected wiring → Replace the PCSV-A,B

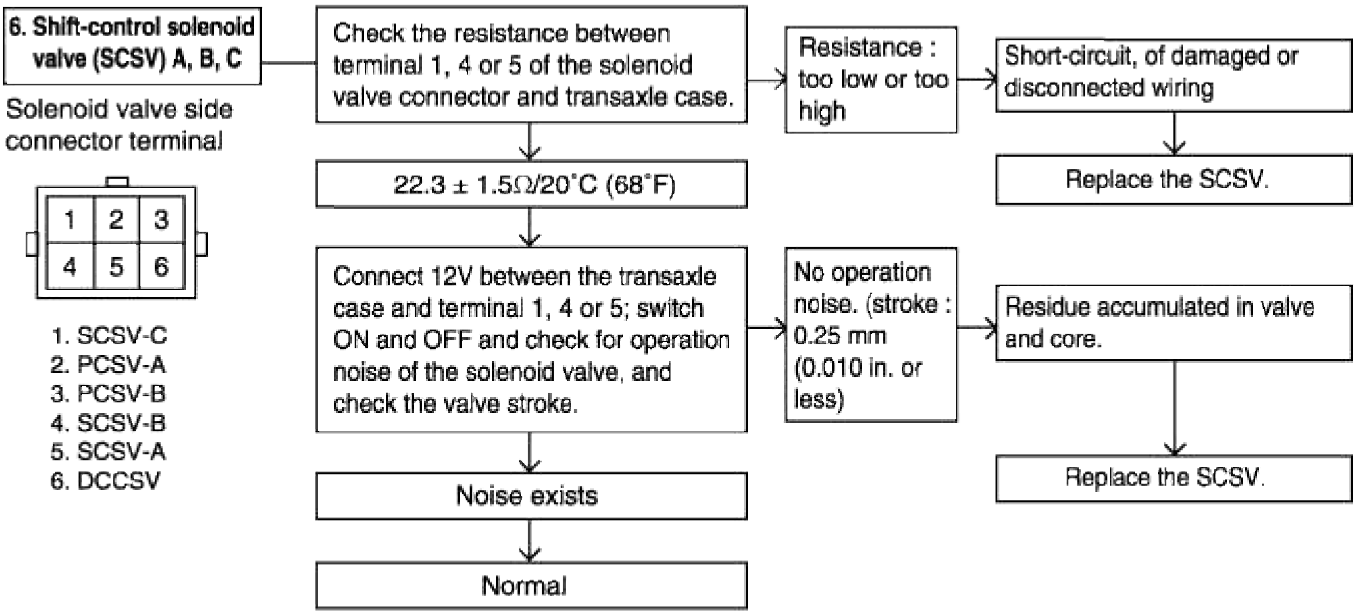
2.9 ± 0.3Ω/20°C (68°F)

Connect 12V between the transaxle case and terminal 2, 3; switch ON and OFF and check for operation noise.

No operation noise. (Stroke : 0.3 mm (0.012 in.) or less) → Foreign materiall caught between the valve and guide → Replace the PCSV-A,B

Noise exists

Normal



6. Shift-control solenoid valve (SCSV) A, B, C

Solenoid valve side connector terminal

1. SCSV-C
2. PCSV-A
3. PCSV-B
4. SCSV-B
5. SCSV-A
6. DCCSV

Check the resistance between terminal 1, 4 or 5 of the solenoid valve connector and transaxle case.

Resistance : too low or too high → Short-circuit, of damaged or disconnected wiring → Replace the SCSV.

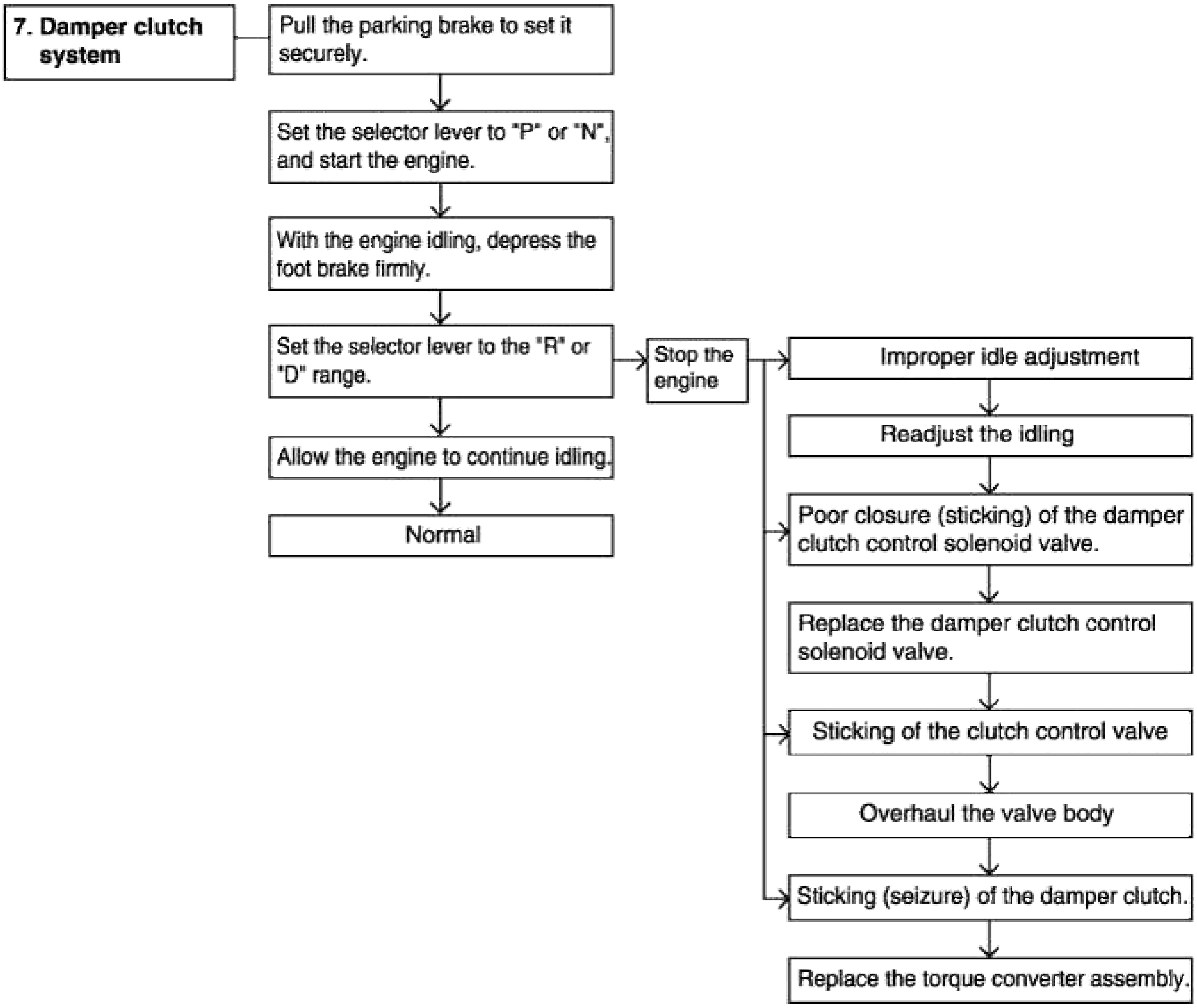
22.3 ± 1.5Ω/20°C (68°F)

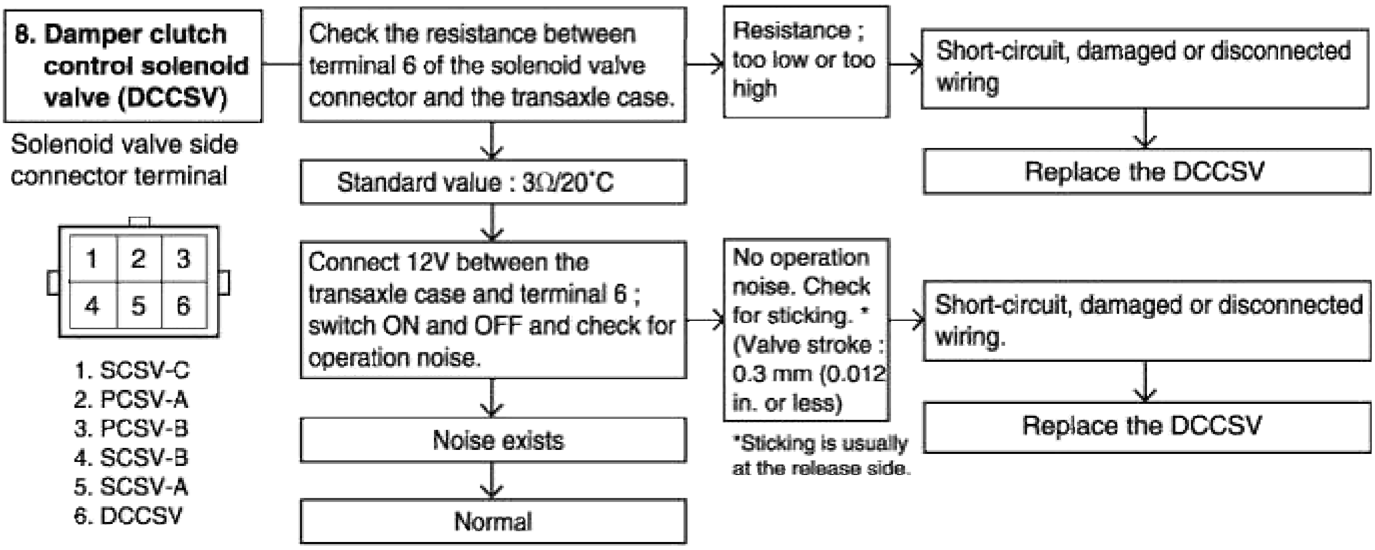
Connect 12V between the transaxle case and terminal 1, 4 or 5; switch ON and OFF and check for operation noise of the solenoid valve, and check the valve stroke.

No operation noise. (stroke : 0.25 mm (0.010 in. or less) → Residue accumulated in valve and core. → Replace the SCSV.

Noise exists

Normal

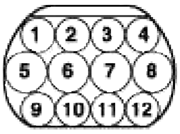

7. Damper clutch system
Pull the parking brake to set it securely.
Set the selector lever to "P" or "N", and start the engine.
With the engine idling, depress the foot brake firmly.
Set the selector lever to the "R" or "D" range.
Allow the engine to continue idling.
Normal
Stop the engine
Improper idle adjustment
Readjust the idling
Poor closure (sticking) of the damper clutch control solenoid valve.
Replace the damper clutch control solenoid valve.
Sticking of the clutch control valve
Overhaul the valve body
Sticking (seizure) of the damper clutch.
Replace the torque converter assembly.

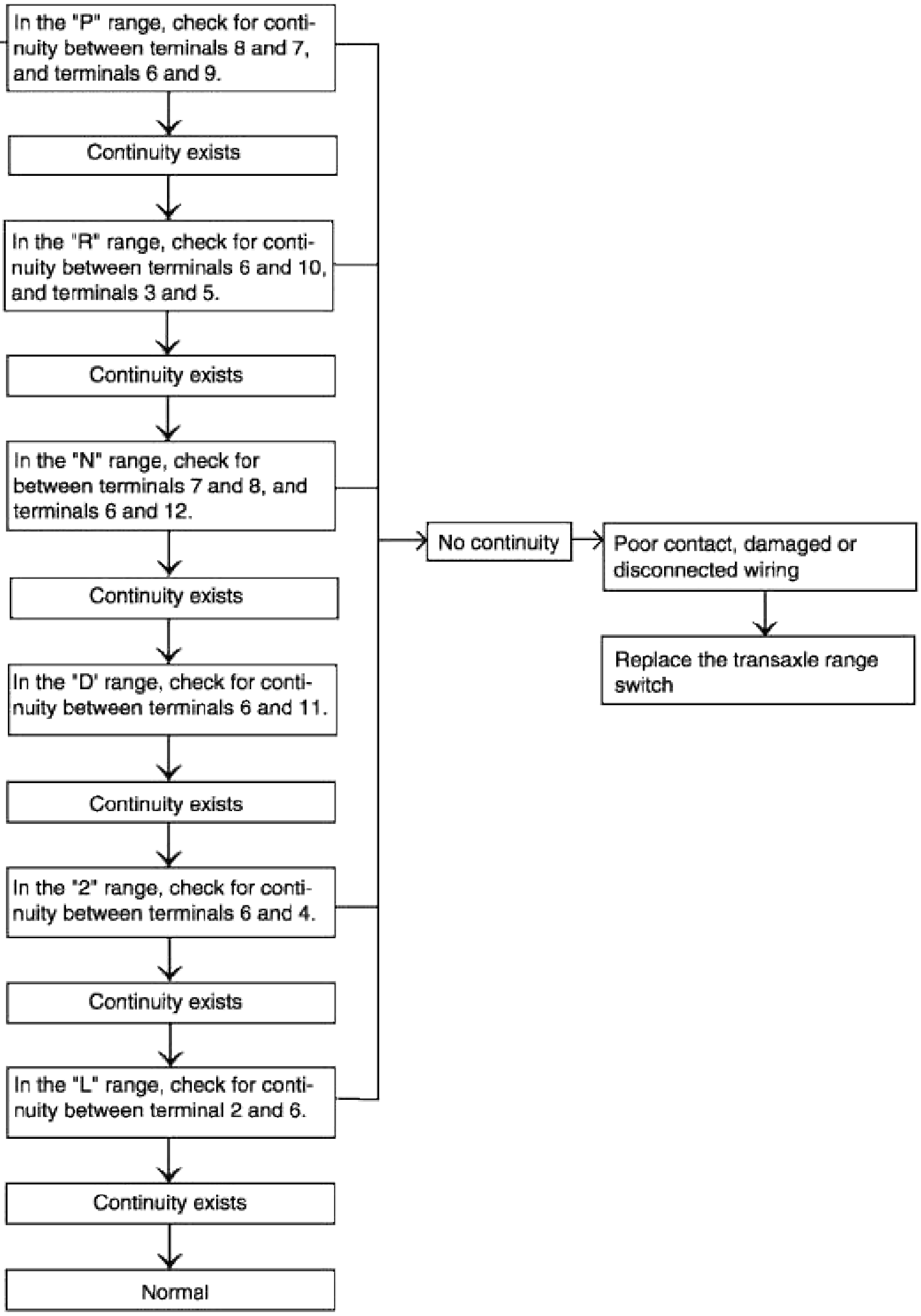

8. Damper clutch control solenoid valve (DCCSV)
Solenoid valve side connector terminal
1
2
3
4
5
6
1. SCSV-C
2. PCSV-A
3. PCSV-B
4. SCSV-B
5. SCSV-A
6. DCCSV
Check the resistance between terminal 6 of the solenoid valve connector and the transaxle case.
Standard value : 3Ω/20°C
Connect 12V between the transaxle case and terminal 6 ; switch ON and OFF and check for operation noise.
Noise exists
Normal
Resistance ; too low or too high
Short-circuit, damaged or disconnected wiring
Replace the DCCSV
No operation noise. Check for sticking. * (Valve stroke : 0.3 mm (0.012 in. or less)
*Sticking is usually at the release side.
Short-circuit, damaged or disconnected wiring.
Replace the DCCSV

tomsn048@gmail.com

9. Transaxle range switch

Switch side connector terminal





In the "P" range, check for continuity between terminals 8 and 7, and terminals 6 and 9.

Continuity exists

In the "R" range, check for continuity between terminals 6 and 10, and terminals 3 and 5.

Continuity exists

In the "N" range, check for between terminals 7 and 8, and terminals 6 and 12.

Continuity exists

In the 'D' range, check for continuity between terminals 6 and 11.

Continuity exists

In the "2" range, check for continuity between terminals 6 and 4.

Continuity exists

In the "L" range, check for continuity between terminal 2 and 6.

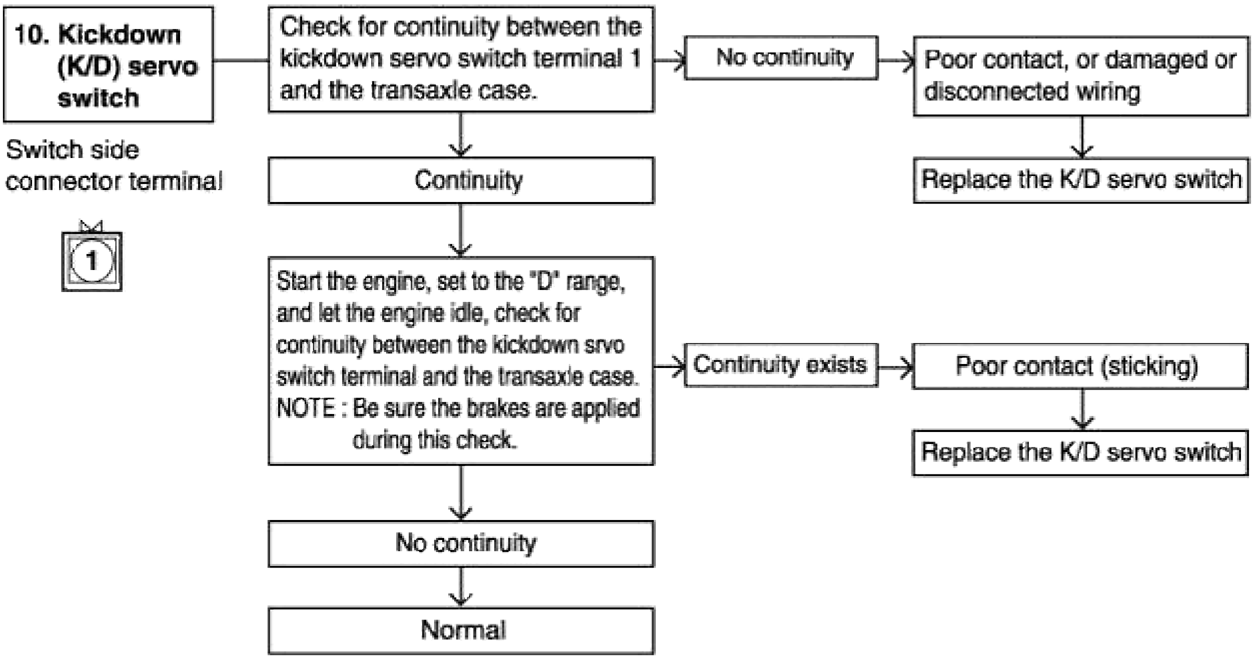
Continuity exists

Normal

No continuity

Poor contact, damaged or disconnected wiring

Replace the transaxle range switch



10. Kickdown (K/D) servo switch
Switch side connector terminal
1

Check for continuity between the kickdown servo switch terminal 1 and the transaxle case.

No continuity → Poor contact, or damaged or disconnected wiring → Replace the K/D servo switch

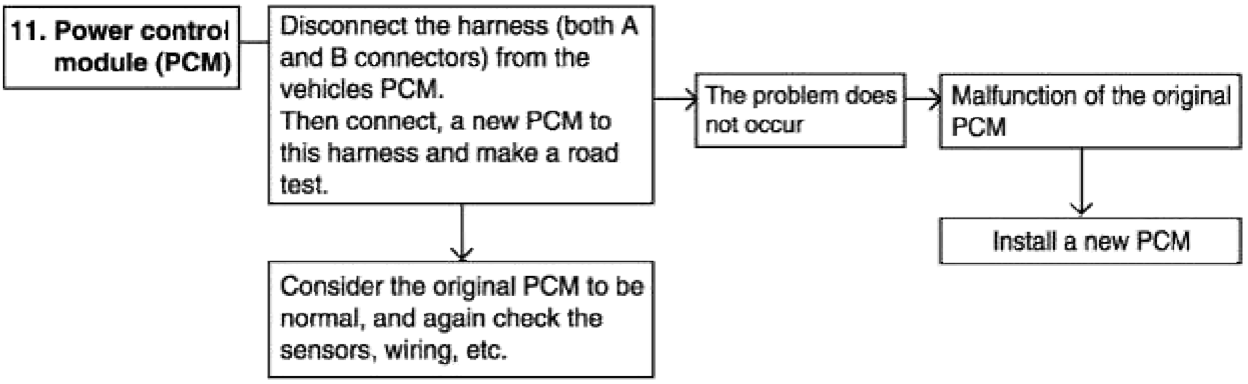
Continuity

Start the engine, set to the "D" range, and let the engine idle, check for continuity between the kickdown srvo switch terminal and the transaxle case.
NOTE : Be sure the brakes are applied during this check.

Continuity exists → Poor contact (sticking) → Replace the K/D servo switch

No continuity

Normal



Disconnect the harness (both A and B connectors) from the vehicles PCM.
Then connect, a new PCM to this harness and make a road test.

The problem does not occur → Malfunction of the original PCM → Install a new PCM

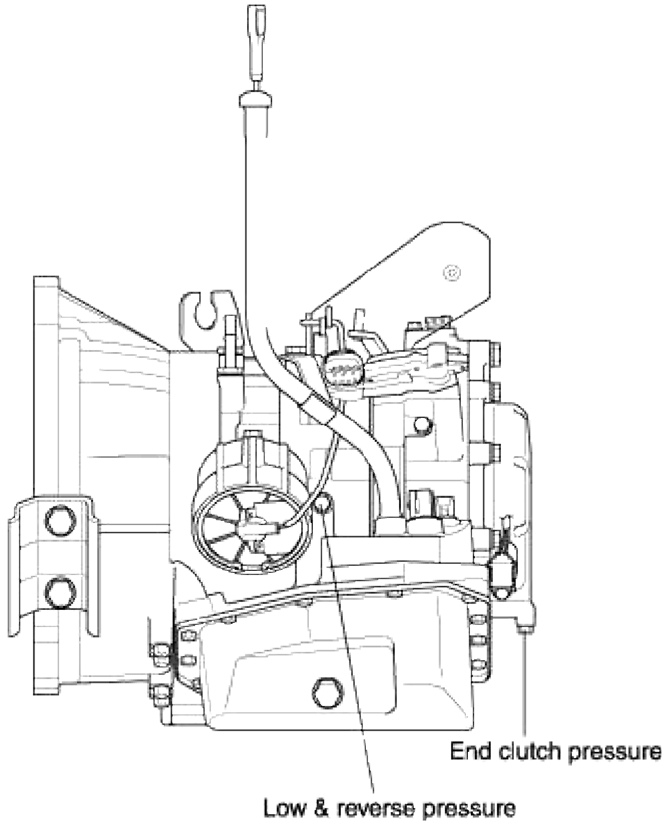
Consider the original PCM to be normal, and again check the sensors, wiring, etc.

OIL PRESSURE TESTS

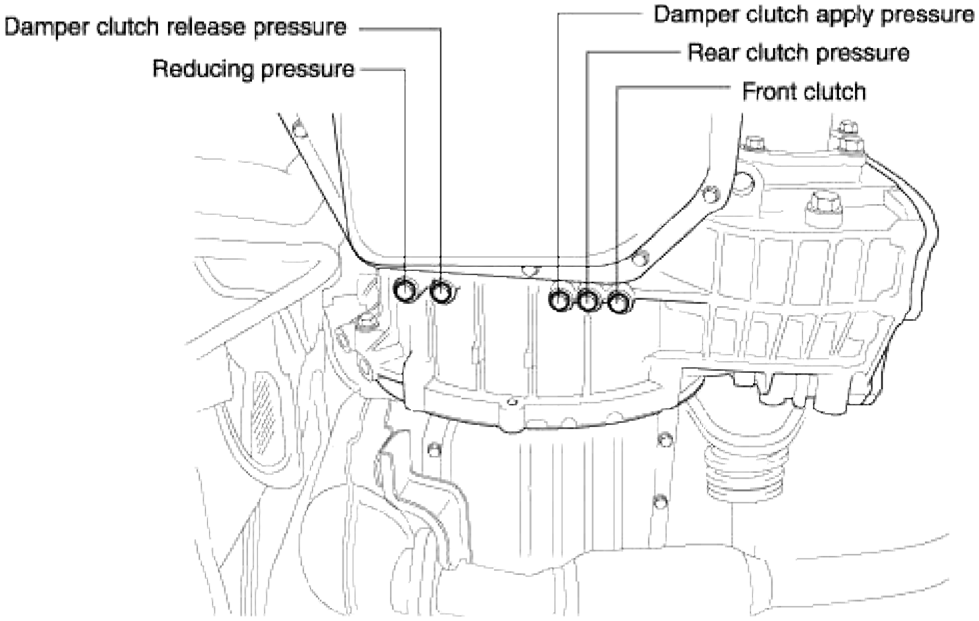
1. Completely warm up the transaxle.
2. Raise the front of the vehicle so that the front wheels can be rotated.
3. Connect an engine tachometer and place it in a position where it's easy to see.

tomsn048@gmail.com

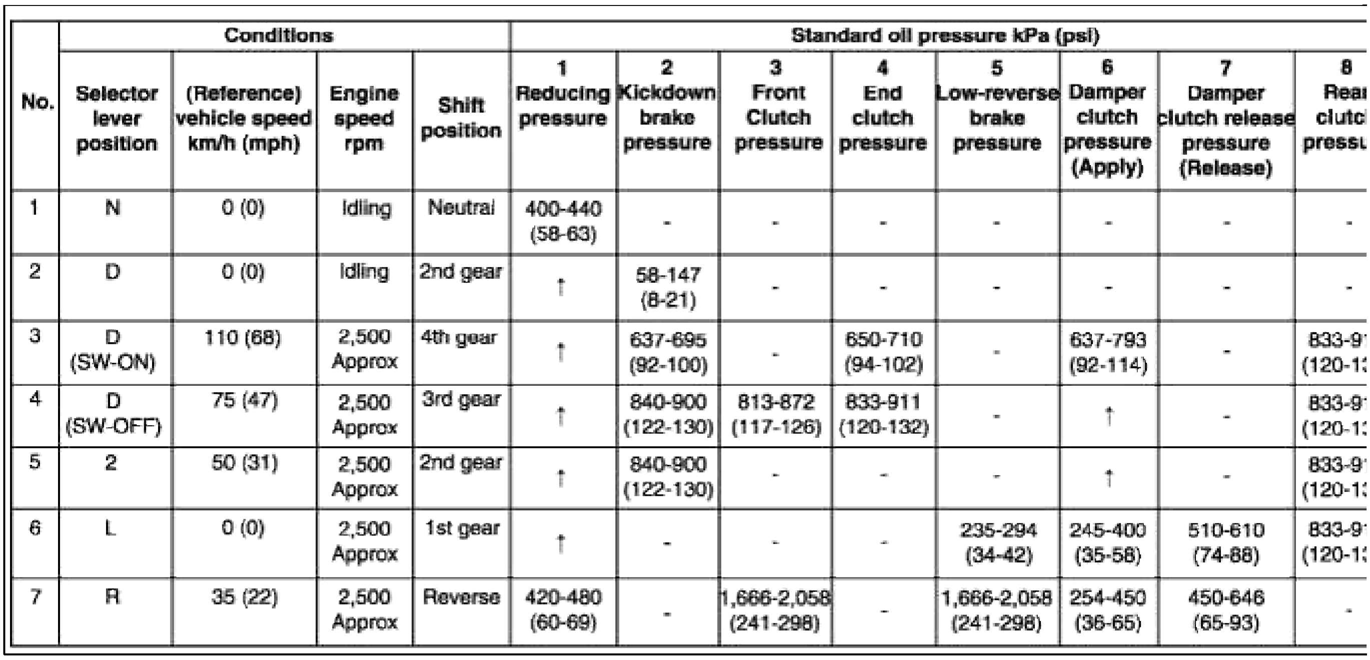
4. Attach the special oil-pressure gauge (09452-21500) and the adapter (09452-21002) to each oil-pressure outlet port.
   When the reverse pressure is to be tested, the 3,000 kpa (400 psi) type of gauge should be used.


End clutch pressure
Low & reverse pressure

5. Measure the oil pressure under various conditions. Check to be sure that the measured results are within the stand value range shown in the "Standard oil pressure table" below. If the oil pressure is not within the specified range, check and repair as described in the section "Preliminary Steps if Oil Pressure Is Not Normal" on the next page.


Damper clutch release pressure
Reducing pressure
Damper clutch apply pressure
Rear clutch pressure
Front clutch

STANDARD OIL PRESSURE TABLE



No.	Conditions				Standard oil pressure kPa (psi)							
	Selector lever position	(Reference) vehicle speed km/h (mph)	Engine speed rpm	Shift position	1 Reducing pressure	2 Kickdown brake pressure	3 Front Clutch pressure	4 End clutch pressure	5 Low-reverse brake pressure	6 Damper clutch pressure (Apply)	7 Damper clutch release pressure (Release)	8 Rea clutc pressu
1	N	0 (0)	Idling	Neutral	400-440 (58-63)	-	-	-	-	-	-	-
2	D	0 (0)	Idling	2nd gear	↑	58-147 (8-21)	-	-	-	-	-	-
3	D (SW-ON)	110 (68)	2,500 Approx	4th gear	↑	637-695 (92-100)	-	650-710 (94-102)	-	637-793 (92-114)	-	833-9 (120-1
4	D (SW-OFF)	75 (47)	2,500 Approx	3rd gear	↑	840-900 (122-130)	813-872 (117-126)	833-911 (120-132)	-	↑	-	833-9 (120-1
5	2	50 (31)	2,500 Approx	2nd gear	↑	840-900 (122-130)	-	-	-	↑	-	833-9 (120-1
6	L	0 (0)	2,500 Approx	1st gear	↑	-	-	-	235-294 (34-42)	245-400 (35-58)	510-610 (74-88)	833-9 (120-1
7	R	35 (22)	2,500 Approx	Reverse	420-480 (60-69)	-	1,666-2,058 (241-298)	-	1,666-2,058 (241-298)	254-450 (36-65)	450-646 (65-93)	-

NOTE

- must be 19.6 kPa (2.8 psi) or less.

PRELIMINARY STEPS IF OIL PRESSURE IS NOT NORMAL

Trouble symptom	Probable cause	Remedy
Line pressures are all low (or high). Line pressure refers to oil pressures 2, 3, 4, 5, 6, 7 and 8 in the "Standard oil pressure table" on the previous page.	• Obstructed oil filter • Improper adjustment of oil pressure (line pressure) regulator valve • Sticking of regulator valve • Looseness of valve body tightening part • Improper oil pump discharge pressure	• Visually inspect the oil filter; replace the oil filter if it is restricted. • Measure line pressure 2 (kickdown brake pressure); if the pressure is notthe standard value, readjust the line pressure, or if necessary, replace thevalve body assembly. • Check the operation of the regulator valve; repair if necessary, or replacethe valve body assembly. • Tighten the valve body tightening bolt and installation bolt. • Check the side clearance of the oil pump gear; replace the oil pump assembly if necessary.
Improper reducing pressure	• Improper line pressure • Clogging of the filter (L-shaped type) of the reducing-pressure circuit • Improper adjustment of the reducing pressure • Improper adjustment of the reducing pressure • Sticking of the reducing valve • Looseness of valve body	• Check the 2 kickdown brake pressure (line pressure); if the line pressure is not the standard value, check as described in item 1 above. • Disassemble the valve body assembly and check the filter; replace the filter if it is restricted. • Measure the 1 reducing pressure; if it is not the standard value, readjust, or replace the valve body assembly.

tomsn048@gmail.com

	• Looseness of valve body tightening part	• Check the operation of the reducing valve; if necessary, repair it, or replace the valve body assembly. • Tighten the valve body tightening bolt and installation bolt.
Improper kickdown brake pressure	• Malfunction of the D ring or seal ring or the sleeve or kickdown servo piston. • Looseness of valve body tightening part. • Functional malfunction of the valve body assembly.	• Disassemble the kickdown servo and check whether the seal ring or D-ring is damaged. If it is cut or has scratches, replace the seal ring or D-ring. • Tighten the valve body tightening bolt and installation bolt. • Replace the valve body assembly.
Improper front clutch pressure	• Malfunction of the D-ring of the sleeve or kickdown servo piston. • Looseness of valve body tightening part • Malfunction of the valve body assembly. • Wear of the front clutch piston or retainer, or malfunction of the D-ring. (Refer to the figure on the next page.) • Oil pump gasket or seal ring (2) damaged.	• Disassemble the kickdown servo and check whether the seal ring is damaged.If it is cut or has scratches, replace the seal ring or D-ring. • Tighten the valve body tightening bolt and installation bolt. • Replace the valve body assembly. • Disassemble the transaxle itself and check whether or not there is wear of the front clutch piston and retainer inner circumference, or damage of the D-ring. If there is any wear or damage, replace the piston, retainer, D-ring and or seal ring.
Improper end clutch pressure	• Malfunction of a D-ring, seal ring of the end clutch or O-ring of the pipe (Refer to the figure on the next page.) • Looseness of valve body tightening part. • Malfunction of the valve body assembly	• Disassemble the end clutch and check the seal ring, D-ring of the piston, seal ring of the retainer, etc.; replace if there are cuts, scars, scratcher or damage. • Tighten the valve body tightening bolt and installation bolt. • Replace the valve body assembly.
Improper low-reverse brake pressure	• O-ring between valve body and transaxle damaged or missing • Looseness of valve body tightening part • Malfunction of the valve body assembly • Malfunction of the O-ring of the low-reverse brake piston or the O-ring of the retainer (Refer to the figure on the next page.)	• Remove the valve body assembly and check to be sure that the O-ring at the upper surface of the upper valve body is not missing or damaged; install or replace the O-ring if necessary. • Tighten the valve body tightening bolt and installation bolt. • Replace the valve body assembly. • Disassemble the transaxle itself and check the O-ring for damage; replace if there are cuts, scars, scratches or damage.

Improper torque converter pressure	• Sticking of the damper clutch control solenoid valve (DCCSV) • Clogging or leaking of the oil cooler and/or lines. • Damaged seal ring of the input shaft. • Malfunction of the torque converter.	• Check the operation of the damper clutch system and the DCCSV. • Repair or replace, as necessary, the cooler and/or lines. • Disassemble the transaxle itself and check for damage of the seal ring; replace the seal ring if there is damage. • Replace the torque converter.
Improper rear clutch pressure	• Malfunction of the D-ring or seal ring of the rear clutch. • Looseness of valve body tightening part. • Functional malfunction of the valve body assembly.	• Tighten the value body tightening bolt and installation bolt. • Replace the valve body assembly.
Improper damper clutch release pressure.	Same as the probable cause of damper clutch release pressure	Same as the remedy of damper clutch release pressure.

CONVERTER STALL TEST

A stall test determines the maximum engine speed obtained at full throttle in "D" and "R" range. This test checks the torque converter stator overrunning clutch operation, and the holding ability of the transaxle clutches and the low-reverse brake.

> WARNING
>
> During this test, make sure that nobody stands in front of or behind the vehicle.

1. Check transaxle fluid level. Fluid should be at normal operating temperature [80~90°C (176~194°F)]. Engine coolant should also be at normal operating temperature [80~90°C (176~194°F)].
2. Apply chocks to both rear wheels.
3. Attach an engine tachometer.
4. Apply the parking and service brakes fully.
5. Start the engine.
6. With the selector lever in the "D" position, depress the accelerator pedal fully to read maximum engine rpm. Do not hold the throttle wide open any longer than is necessary to obtain maximum engine rpm reading, and never longer than 5 seconds at a time. If more than one stall test is required, operate the engine at approximately 1,000 rpm in neutral for 2 minutes to cool the transaxle fluid between tests.

   Stall speed:2,200~2,800rpm

7. Place the selector lever in the "R" position and perform the stall test by the same procedure as previously described.

STALL SPEED ABOVE SPECIFICATION IN "D"

If stall speed is higher than specification, the rear clutch or overrunning clutch of the transaxle is slipping. In this case, perform a hydraulic test to locate the cause of slippage.

STALL SPEED ABOVE SPECIFICATION IN "R"

If the stall speed is higher than specification, the front clutch of the transaxle or low-reverse brake is slipping. In this case, perform a hydraulic test to locate the cause of slippage.

STALL SPEED BELOW SPECIFICATION IN "D" AND "R"

If the stall speed is lower than specification, insufficient engine output or a faulty torque converter is suspected. Check for engine misfiring, improper ignition timing, or valve clearance etc. If these are good, the torque converter is faulty.

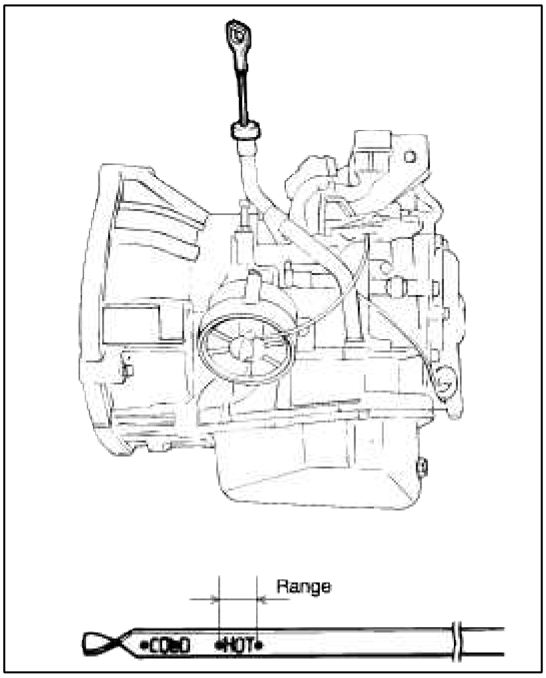
tomsn048@gmail.com

TRANSAXLE FLUID LEVEL INSPECTION

1. Drive the vehicle until the fluid reaches normal operating temperature [80~90°C (176~194°F)].
2. Place the vehicle on a level surface.
3. Move the selector lever through all gear positions. This will fill the torque converter and hydraulic system with fluid, then place lever in "N" (Neutral) position.
4. Before removing the dipstick, wipe all contaminants from around the dipstick. Then take out the dipstick and check the condition of the fluid. The transaxle should be overhauled under the following conditions.
   A. If there is a "burning" door.
   B. If the fluid color has become noticeably black.
   C. If there is a noticeably excessive amount of metal particles in the fluid.
5. Check to see if the fluid level is in the "HOT" range on dipstick. If fluid level is low, add automatic transaxle fluid until the level reaches the "HOT" range.

   Transaxle fluid:GENUINE DIAMOND ATF SP-III

   Low fluid level can cause a variety of abnormal conditions because it allows the pump to take in air along with fluid. Air trapped in the hydraulic system forms bubbles which are compressable. Therefore, pressures will be erratic, causing delayed shifting, sliping clutches and brakes, etc. Improper filling can also raise fluid level too high. When the transaxle has too much fluid, gears churn up foam and cause the same conditions which occur with low fluid level, resulting in accelerated deterioration of automatic transaxle fluid. In either case, air bubbles can cause overheating, and fluid oxidation, which can interfere with normal valve, clutch, and servo operation. Foaming can also result in fluid escaping from the transaxle vent where it may be mistaken for a leak.
6. Be sure to examine the fluid on the dipstick closely.



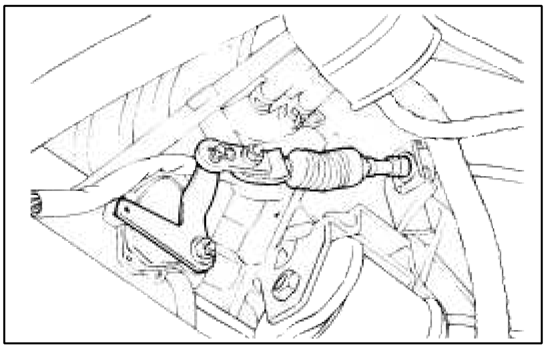
SELECTOR LEVER OPERATION CHECK

1. Shift the selector lever to each range and check to see that the lever moves smoothly and is controlled. Check to see that the position indicator is correct.
2. Check to be sure that the selector lever can be shifted to each position.
3. Start the engine and check to see if the vehicle moves forward when the selector lever is shifted from "N" to "D" and moves backward when shifted to "R".
4. When the shift lever malfunctions, adjust the control cable and the selector lever sleeve. Check for worn shift lever assembly sliding parts.

TRANSAXLE RANGE SWITCH ADJUSTMENT

1. Place selector lever in "N" (Neutral) position.

2. Loosen the manual control lever lock nut to seperate the cable and lever.

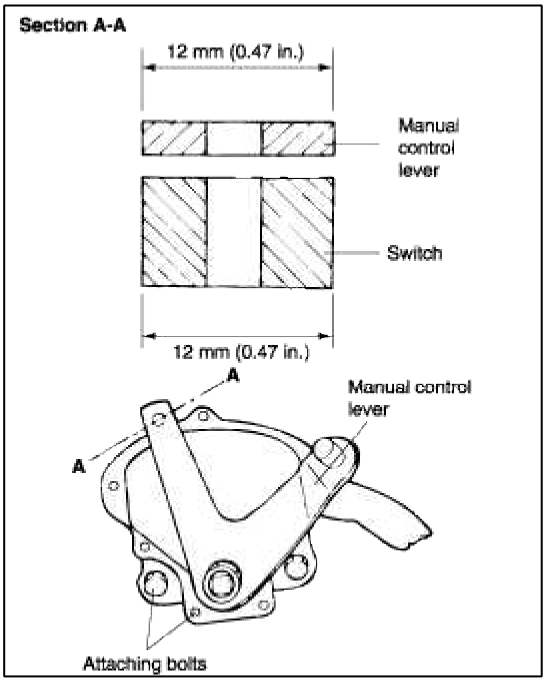


3. Place the manual control lever in the "N" (Neutral) position.
4. Turn the transaxle range switch body until the 12 mm (0.47 in.) wide end of the manual control lever aligns with the switch body flange [12 mm (0.472 in.) wide portion].
5. Tighten the attaching bolts (2 pcs.) to the specified torque.

Transaxle Range Switch Attaching Bolt:
10~12 Nm (100~120 kg·cm, 7~9 lb·ft)

NOTE

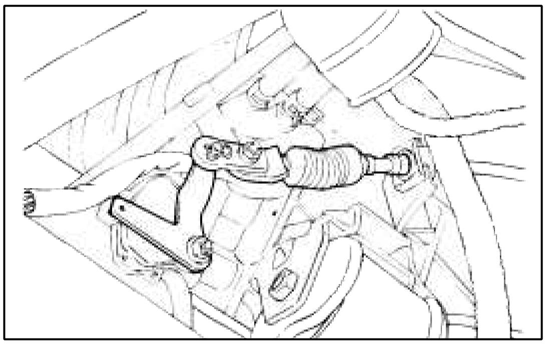
When setting up the switch body, be careful that the O-ring does not drop from the switch body. Tighten the attaching bolts carefully.


Section A-A
12 mm (0.47 in.)
Manual control lever
Switch
12 mm (0.47 in.)
A
Manual control lever
A
Attaching bolts

6. Make sure that the selector lever is in the "N" (Neutral) position.
7. Adjust the flange nut so that there is no slack in the control cable and make sure that the selector lever operates smoothly.

tomsn048@gmail.com

8. Run the vehicle and confirm that the transaxle is set in each range when the selector lever is shifted to each position.



KICKDOWN SERVO ADJUSTMENT

1. Completely remove all dirt and other contaminating materials adhered around the kickdown adjust screw.
2. Loosen the lock nut.
3. Loosen and tighten the adjust screw two times by torque of 5 Nm (3.6 lb·ft)
4. Tighten adjust screw by torque of 5 Nm and then, loosen the adjust screw 3 to 3-1/3 turns.
5. Tighten the lock nut to the specified torque.

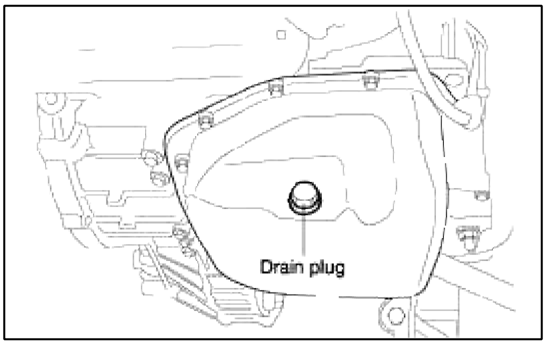
Lock nut:15~22 Nm (150~220 kg·cm, 11~16 lb·ft)

NOTE

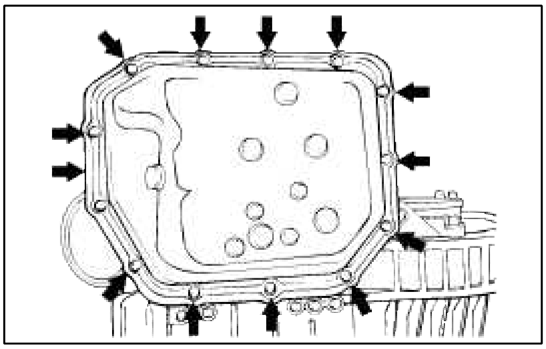
Before assembling, apply sealant (DC780) to the center portion of the adjust screw.

LINE PRESSURE ADJUSTMENT

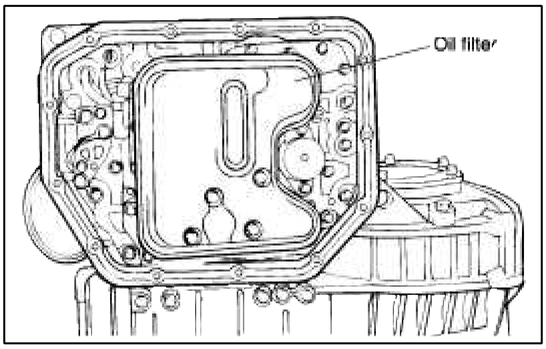
1. Drain out the automatic transaxle fluid.



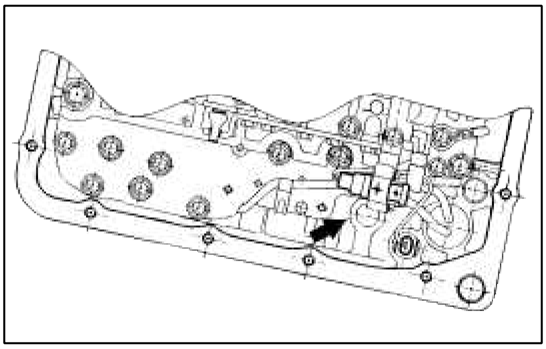
2. Remove the oil pan.



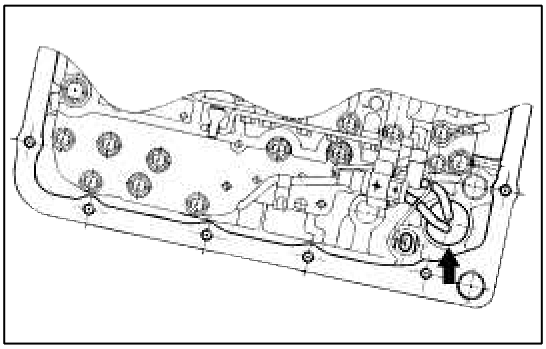
3. Remove the oil filter.



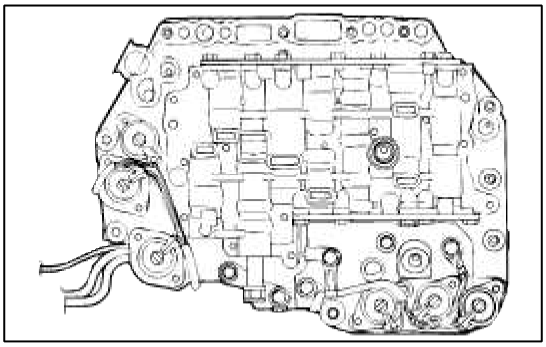
4. Remove the oil-temperature sensor.



5. Press the tab of the solenoid valve harness grommet and push in.

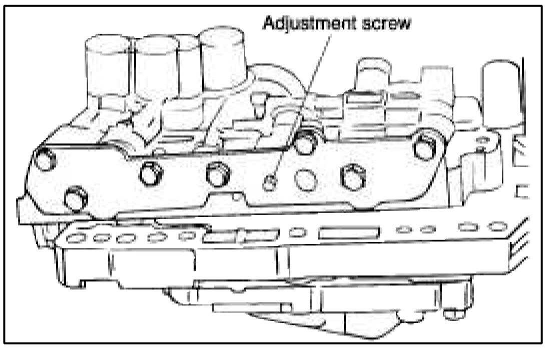


6. Remove the valve body assembly. The manual valve can come out, so be careful not to drop it.

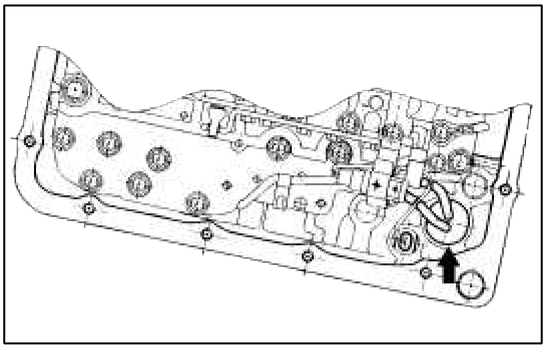


7. Turn the adjustment screw of the regulator valve and adjust so that the line pressure (kickdown brake pressure) reaches the standard value. When the adjustment screw is turned clockwise, the line pressure becomes lower; when it is turned counter-clockwise, it becomes higher.

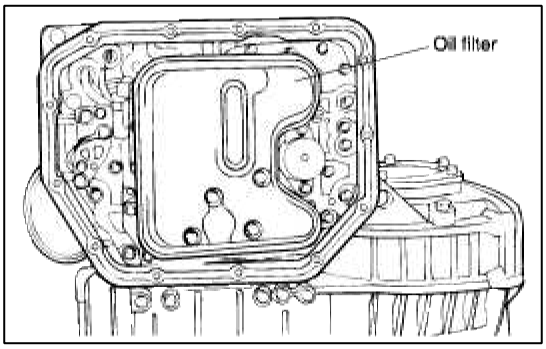
Standard value:
860~900 kPa (122~129 psi, 8.77~9.18 kg/cm²)
Oil pressure change for each turn of adjustment screw:
38 kPa (5.4 psi, 0.39 kg/cm²)



8. Check to be sure that the O-ring is installed on the upper surface of the valve body in it's proper place.
9. Replace the O-ring of the solenoid valve connector with a new one.
10. Install the valve body assembly to the case and then insert the solenoid valve connector into the case. Be sure, at this time, that the notched part of the connector faces as shown in the figure. Also be careful that the lead wiring isn't caught.



11. Tighten the valve body assembly mounting bolts to 10-12 Nm (100-120 kg·cm, 7-9 lb·ft).
12. Install the oil filter.



13. Install a new oil pan gasket with the oil pan.
14. Add the specified amount of automatic transaxle fluid.
15. Perform the oil pressure test. Readjust if necessary.

REDUCING PRESSURE ADJUSTMENT

If the Scan Tool is not abailable

1. Remove parts up to the oil filter in the same way as for adjustment of the line pressure. The valve body need not be removed.

2. Turn the adjustment screw of the lower valve body and adjust so that the reducing pressure is the standard value. When the adjustment screw is turned clockwise, the reducing pressure becomes lower; when it is turned counter clockwise, it becomes higher.

NOTE

When adjusting the reducing pressure, aim for the center value (425 kPa, 60 psi) of the standard value allowance.

Standard value:
420 kPa (60 psi, 4.2±0.2 kg·cm²)
Oil pressure change for each turn of the adjustment screw:
22 kPa (4.3 psi, 0.22 kg·cm²)

---

3. Install the oil filter and oil pan in the same way as for adjustment of the line pressure.
4. Peform the oil pressure test. Readjust if necessary.

If the Scan Tool is used

1. Adjust the pressure control solenoid so that the kickdown brake pressure is the standard value when activated to 50% duty by the Scan Tool.

Standard value:
320±30 kPa (39±1 psi, 3.2±0.3 kg·cm²)
Oil pressure change for each turn of the adjustment screw:
30 kPa (3 psi, 0.3 kg·cm²)

---

2. Check to be sure that the reducing pressure (after the adjustment is completed) is within the range of 370~490 kPa (53~70 psi, 3.8~5.0 kg·cm²).

CAUTION

This adjustment should be made with an oil temperature of 80-90°C (176-194°F). If the adjustment is made at a temperature that is too high, the line pressure will drop during idling, with the result that it might not be possible to make the correct adjustment.

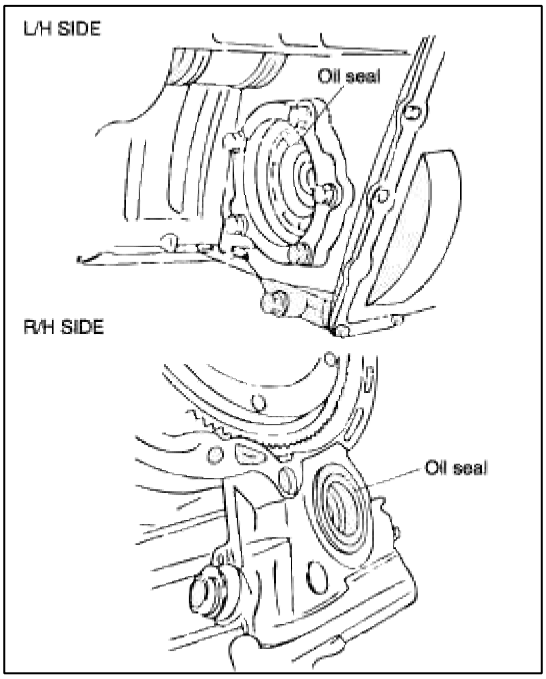
THROTTLE POSITION SENSOR INSPECTION

Refer to GROUP FUEL SYSTEM.

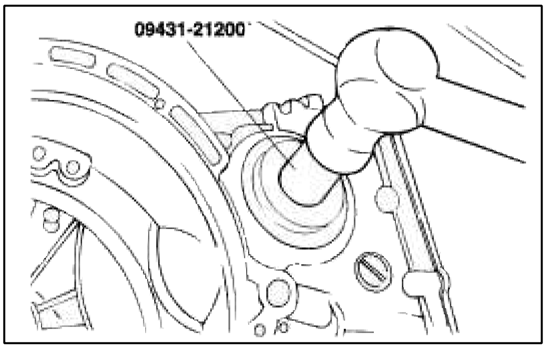
DRIVE SHAFT OIL SEALS REPLACEMENT

1. Disconnect the drive shaft from the transaxle. (Refer to DRIVE SHAFT&FRONT AXLE)

2. Using a flat-tip (-) screwdriver, remove the oil seal.



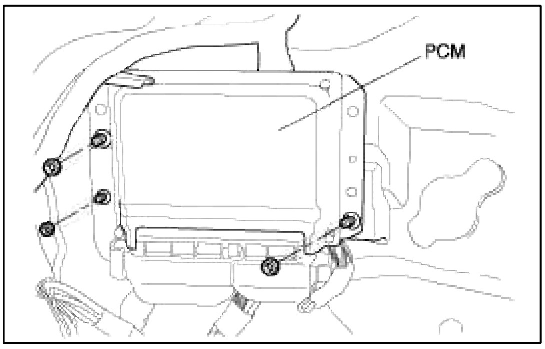
3. Using the special tool (09431-21200), tap the drive shaft oil seal into the transaxle.



4. Apply a coating of the transaxle fluid to the lip of the oil seal.

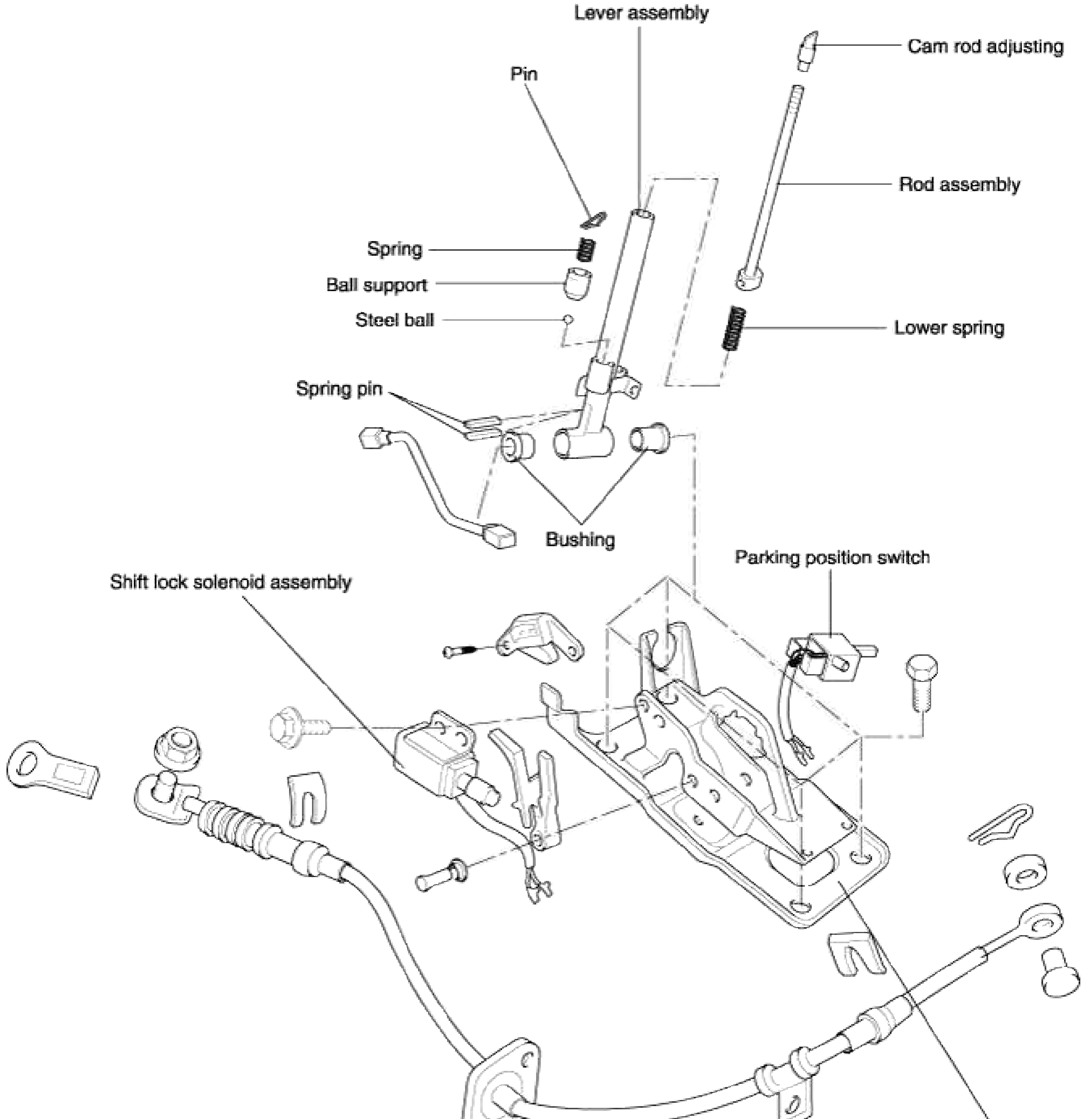
PCM REPLACEMENT

PCM (Power Control Module) is located at the dash panel of the upper side of brake pedal in the driver side.



Automatic Transaxle System > Automatic Transaxle Control System > Shift Lever > Components and Components Location

SHIFT LEVER ASSEMBLY


Lever assembly
Cam rod adjusting
Pin
Rod assembly
Spring
Ball support
Steel ball
Lower spring
Spring pin
Bushing
Parking position switch
Shift lock solenoid assembly
Bracket assembly

Automatic Transaxle System > Automatic Transaxle Control System > Shift Lever > Repair procedures

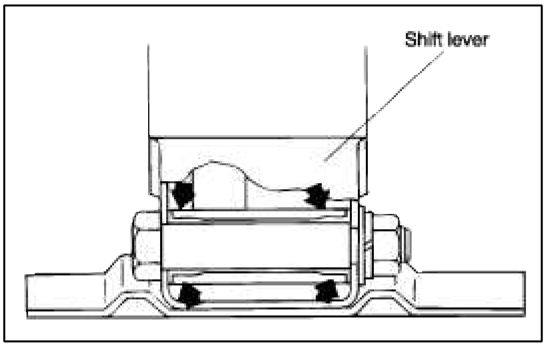
INSPECTION

- Check the detent place for wear.
- Check the bushing for wear or damage.
- Check the spring for damage or deterioration.
- Check the pin at the end of the rod assembly for wear.

REASSEMBLY

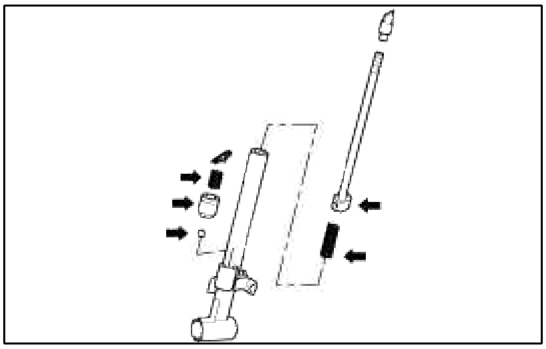
1. Apply a coating of grease to the sliding part of the bushing.

Specified grease:
Chassis grease SAE J310, NLGI No.2



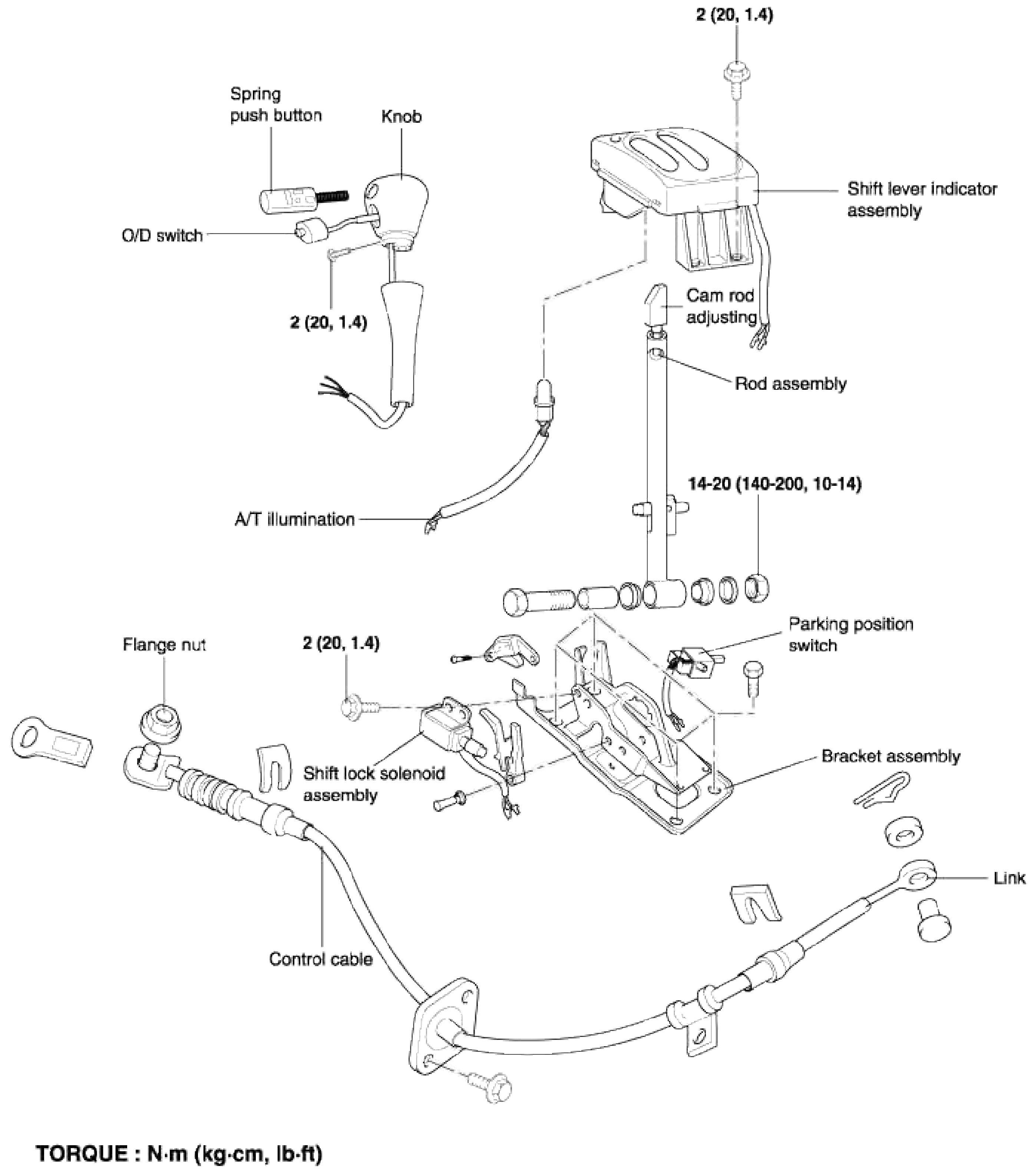
2. Apply the specified grease at the places shown in the figure.

Specified grease:
Multipurpose grease SAE J310, NLGI No.2



Automatic Transaxle System > Automatic Transaxle Control System > Transaxle Shift Control > Components and Components Location

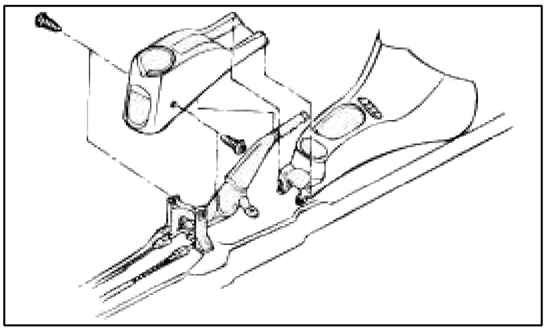
COMPONENTS


2 (20, 1.4)
Spring push button
Knob
Shift lever indicator assembly
O/D switch
2 (20, 1.4)
Cam rod adjusting
Rod assembly
14-20 (140-200, 10-14)
A/T illumination
Parking position switch
Flange nut
2 (20, 1.4)
Shift lock solenoid assembly
Bracket assembly
Link
Control cable
TORQUE : N·m (kg·cm, lb·ft)

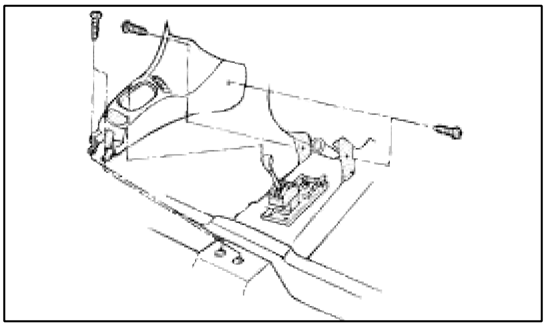
Automatic Transaxle System > Automatic Transaxle Control System > Transaxle Shift Control > Repair procedures

REMOVAL

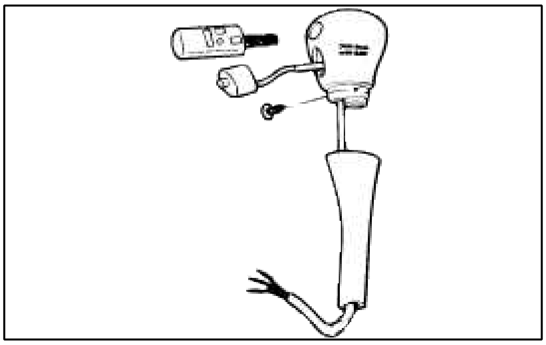
1. Remove the rear console.



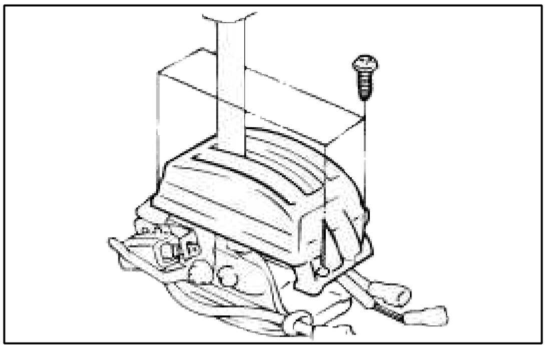
2. Remove the front console.



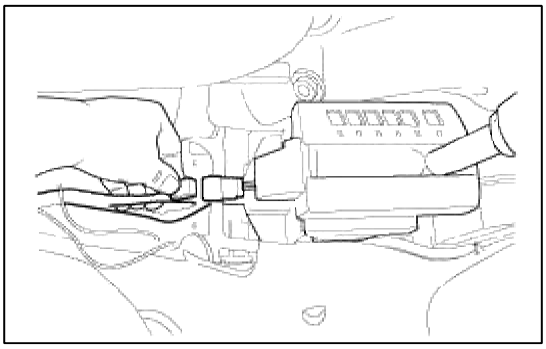
3. Remove the knob installation screws.
4. Disconnect the overdrive switch connector, remove the 3 connector pins from connector with small driver, and then remove selector knob assembly.



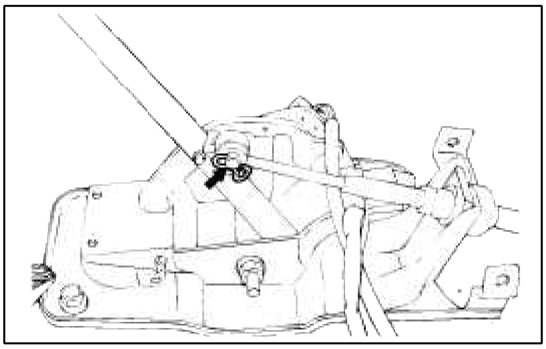
5. Disconnect the position indicator light connector.



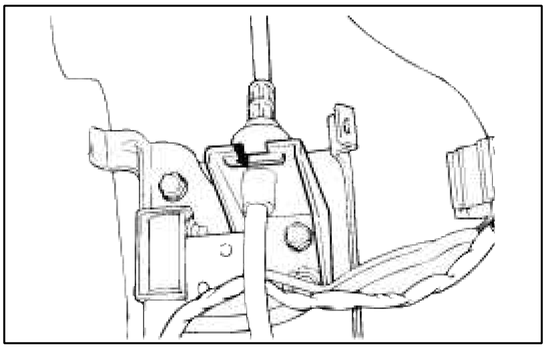
6. Remove the shift lever indicator assembly.



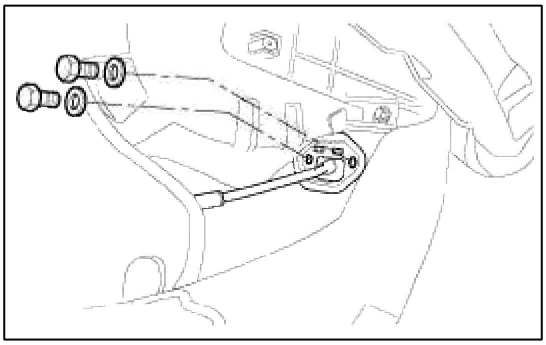
7. Remove the cotter pin.



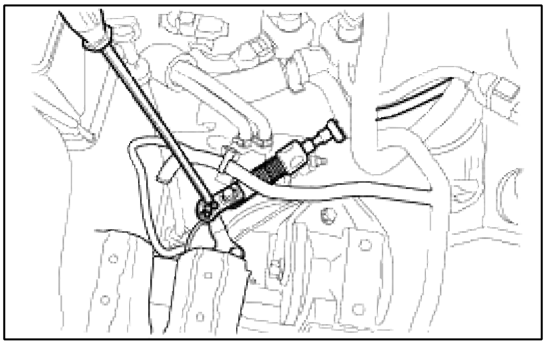
8. Remove the clip from the shift lever side.

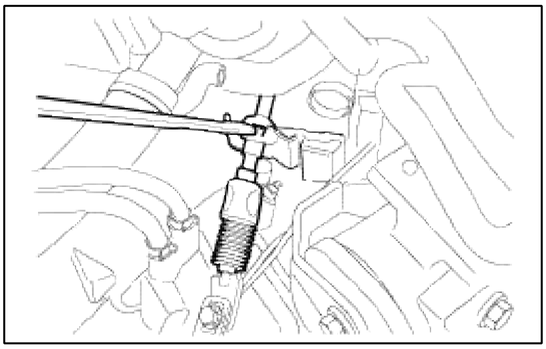


9. Remove the bolt-washer assembly located on dash panel.



10. Remove the shift lever assembly.
11. Remove the transaxle control cable assembly.

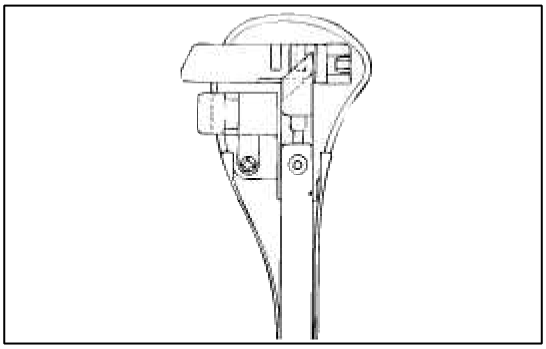




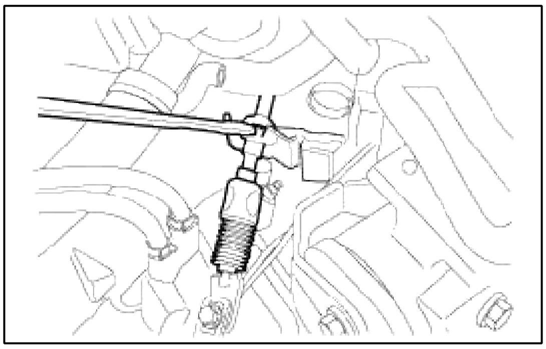
INSTALLATION

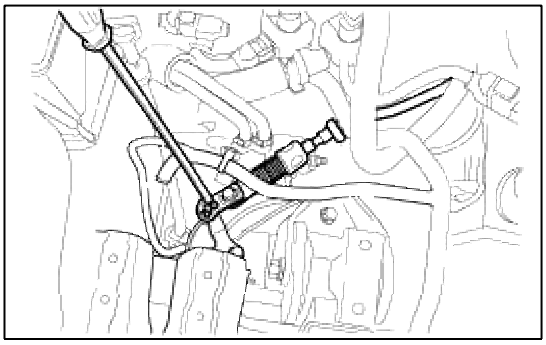
1. Apply a coating of the specified grease to the interior of the bushing.

Specified grease:
Chassis grease SAE J310, NLGI No.0

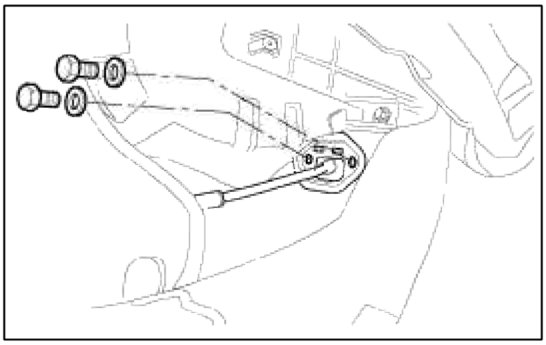


2. Move the shift lever and the transaxle range switch to the N position, and install the control cable.
3. When connecting the control cable to the transaxle mounting bracket, install the clip until it contacts the control cable.

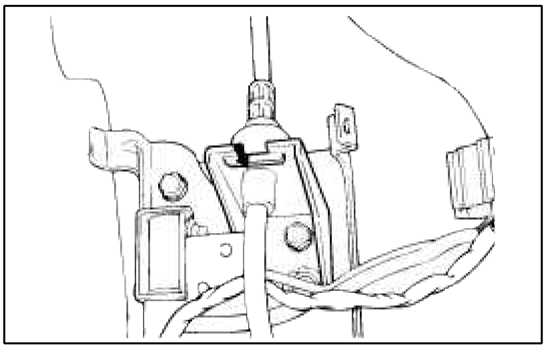




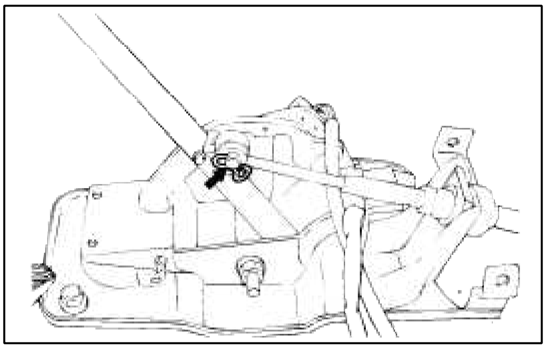
4. Install the bolt-washer assembly and nut.



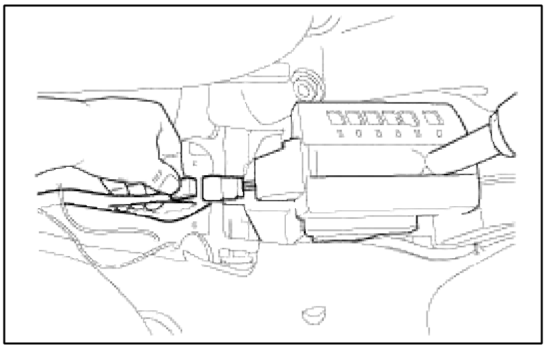
5. Install the clip pin and self lock pin.



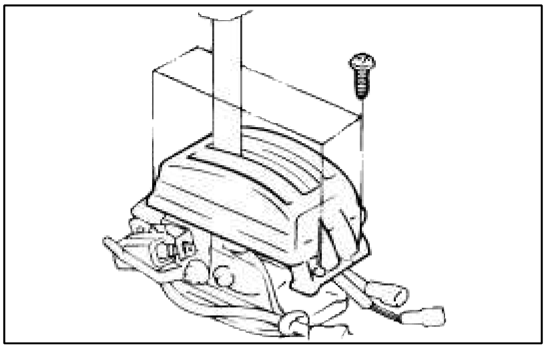
6. Install the cotter pin.



7. Connect the position indicator light connector, the O/D switch connector, the parking position switch connector, normal/economy select switch connector and the shift lock solenoid connector.

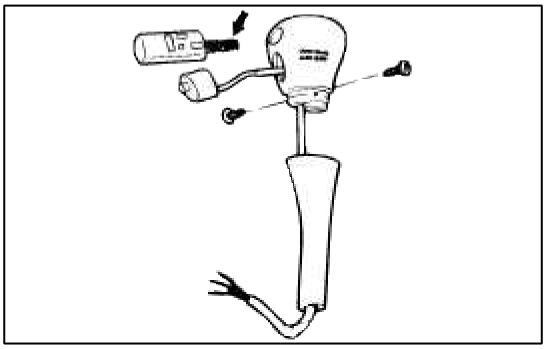


8. Install the shift lever indicator assembly.



9. Apply the specified grease at the place shown in the figure.

Specified grease:
Multipurpose grease SAE J310, NLGI No.2

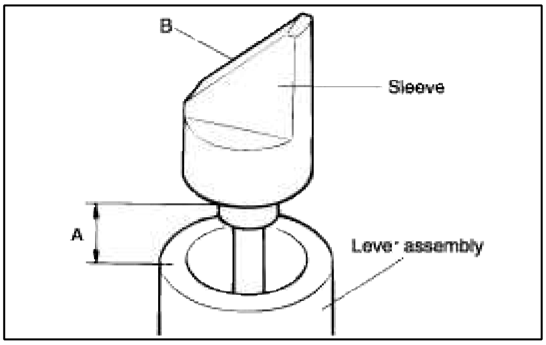


10. Install the shift lever assembly.
11. Place the shift lever in the N position, and then turn the cam adjusting so that the clearance between the cam adjusting and the lever assembly end in within the standard value.

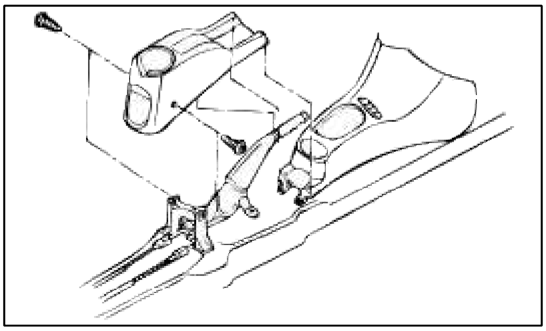
Standard value (A) 15.2-15.9 mm (0.598-0.625 in.)

NOTE

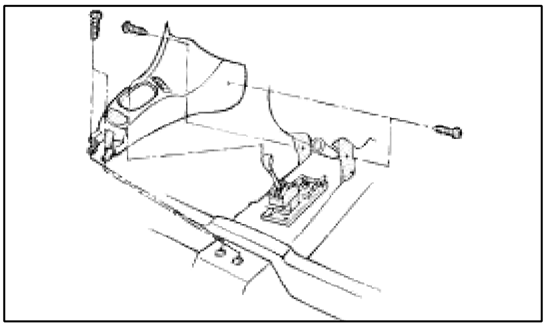
Be sure to face B of the adjusting cam to the push button (driver's side).



12. Insert the O/D switch wiring to the shift lever cover, and then assemble the pin into the O/D switch connector.
13. Install the front console.

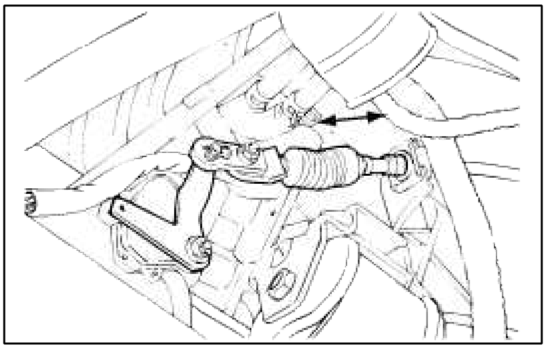


14. Install the rear console.



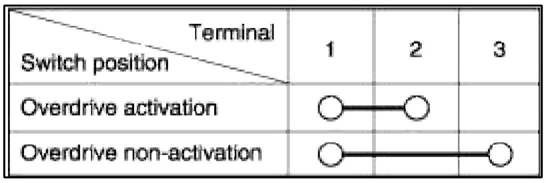
ADJUSTMENT OF CONTROL CABLE

1. Eliminate slack from the control cable with the adjusting flange nut and check that the select lever operates smoothly.
2. Driving the car, check that the transaxle is set in the proper range when the select lever is shifted to each position.



INSPECTION

1. Check the control cable for function and damage.
2. Check the bushing for wear or damage.
3. Check the spring for damage or deterioration.
4. Check the overdrive switch for continuity.



Terminal / Switch position	1	2	3
Overdrive activation	○—	—○	
Overdrive non-activation	○—	—	—○

Automatic Transaxle System > Troubleshooting > P0712

DIAGNOSTIC ITEM

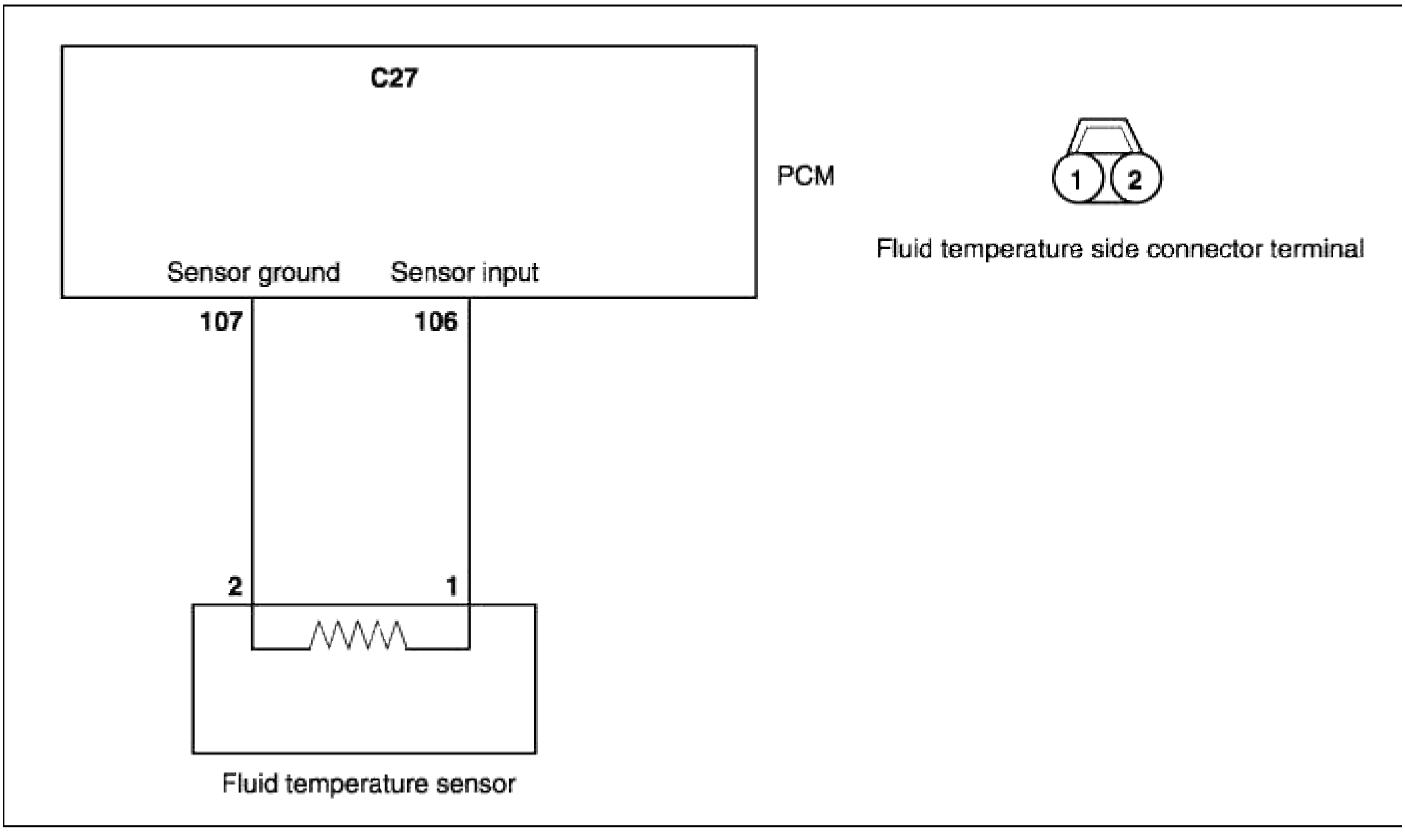
P0712/P0713

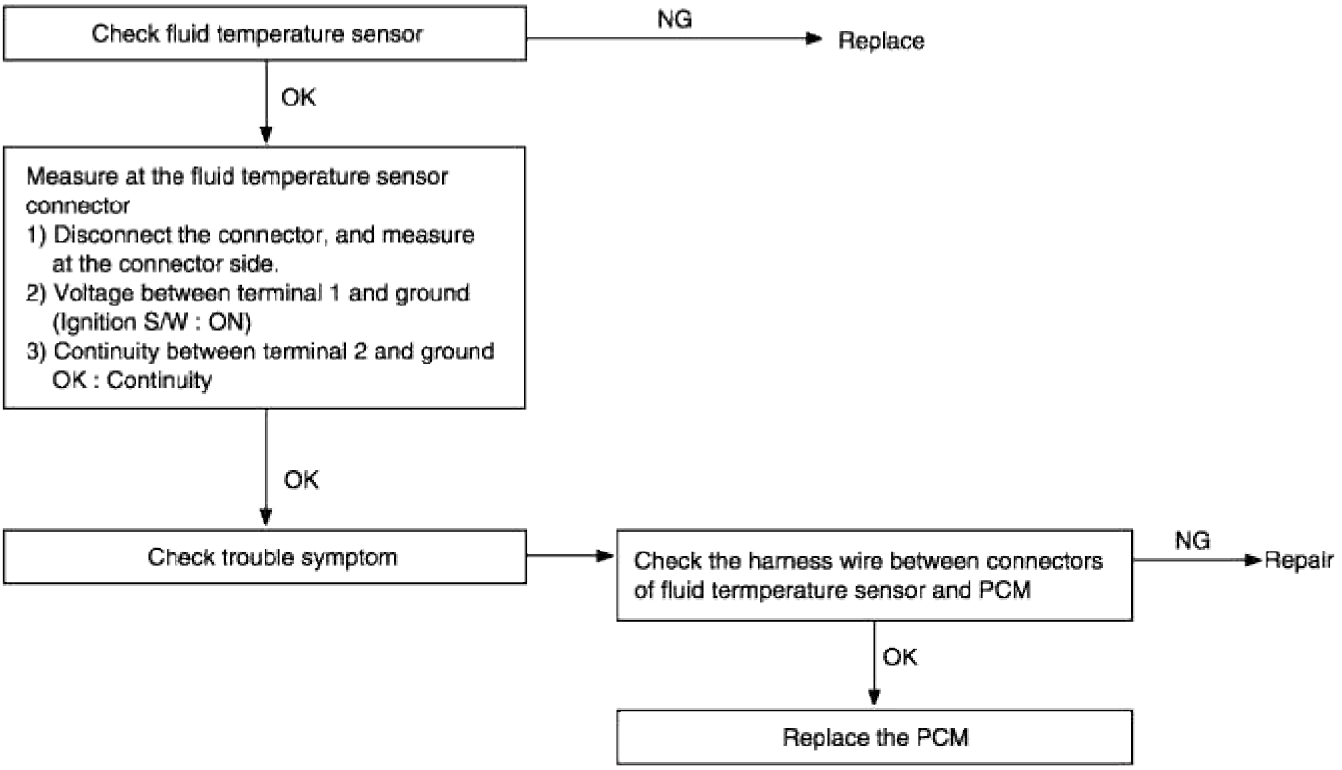
DTC NO	DIAGNOSTIC ITEM	
P0712	FLUID (OIL) TEMPERATURE SENSOR SYSTEM	Short to ground side
P0713	FLUID (OIL) TEMPERATURE SENSOR SYSTEM	Open

TROUBLESHOOTING GUIDE

Detection condition	Possible cause	Check item
• 10 minutes after engine speed>1000 rpm • 10 minutes after pulse generator B>1000 rpm • Low temperature side output voltage>4.3 V **SYMPTOM** • Shift shock • Power shift pattern will not be available	**Malfunction** • Fluid temperature sensor • PCM	• Fluid temperature sensor • Harness & connector

CIRCUIT DIAGRAM


C27
PCM
Sensor ground
Sensor input
107
106
2
1
Fluid temperature sensor
1
2
Fluid temperature side connector terminal


Check fluid temperature sensor
NG
Replace
OK
Measure at the fluid temperature sensor connector
1) Disconnect the connector, and measure at the connector side.
2) Voltage between terminal 1 and ground (Ignition S/W : ON)
3) Continuity between terminal 2 and ground OK : Continuity
OK
Check trouble symptom
Check the harness wire between connectors of fluid termperature sensor and PCM
NG
Repair
OK
Replace the PCM

Automatic Transaxle System > Troubleshooting > P0713

DIAGNOSTIC ITEM

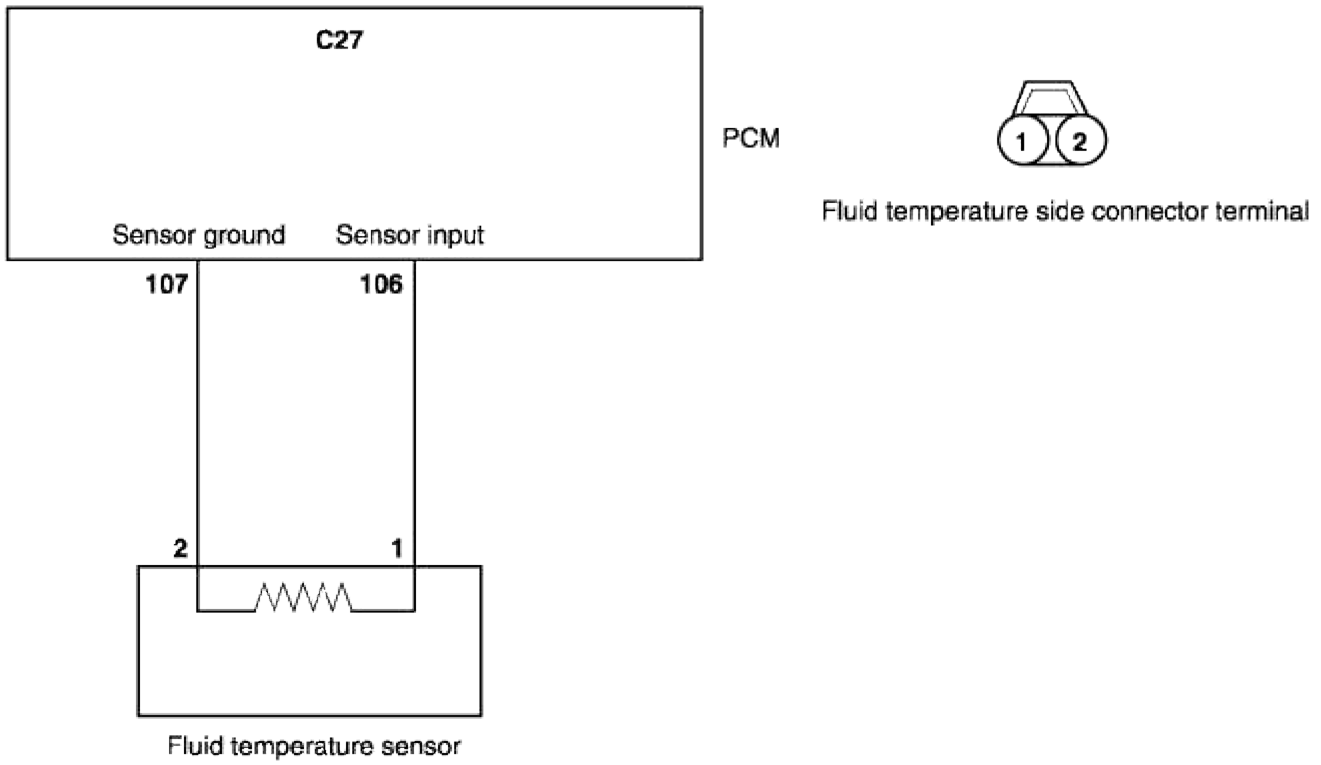
P0712/P0713

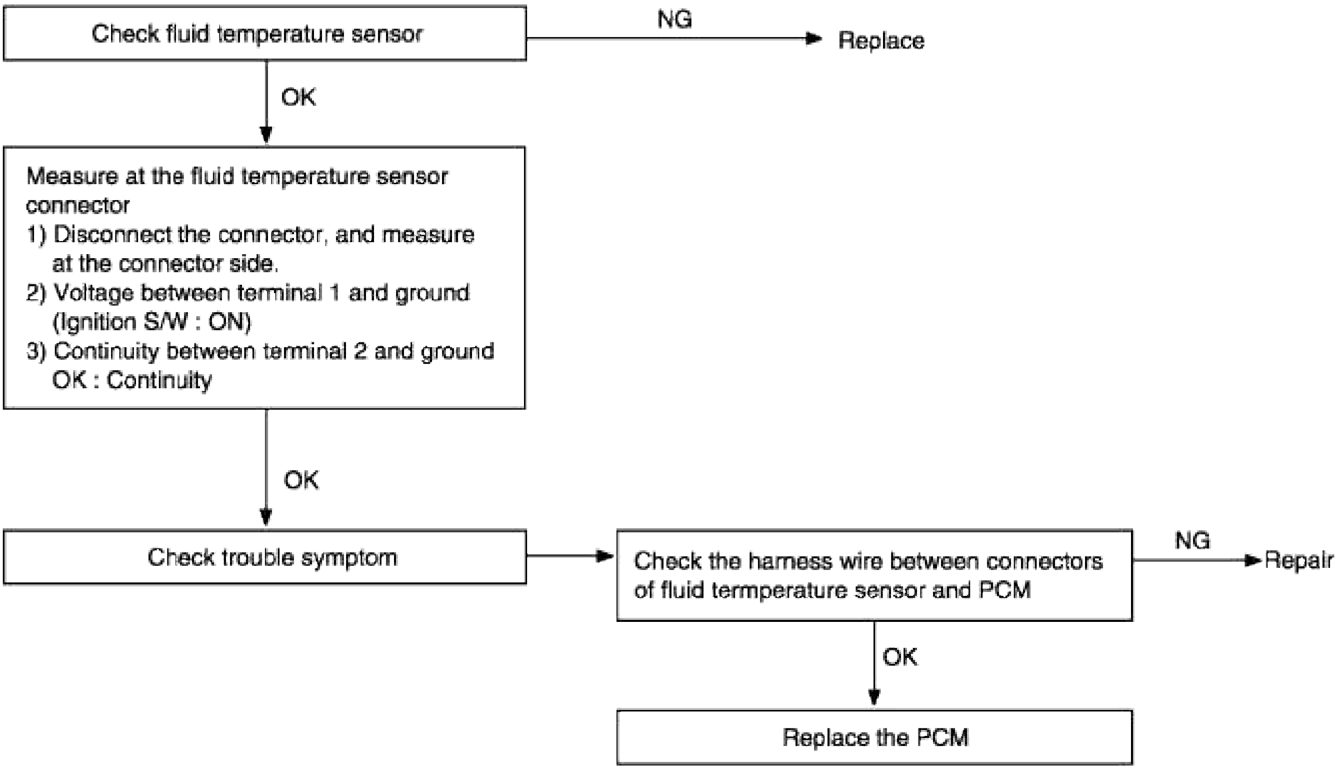
DTC NO	DIAGNOSTIC ITEM	
P0712	FLUID (OIL) TEMPERATURE SENSOR SYSTEM	Short to ground side
P0713	FLUID (OIL) TEMPERATURE SENSOR SYSTEM	Open

TROUBLESHOOTING GUIDE

Detection condition	Possible cause	Check item
• 10 minutes after engine speed>1000 rpm • 10 minutes after pulse generator B>1000 rpm • Low temperature side output voltage>4.3 V **SYMPTOM** • Shift shock • Power shift pattern will not be available	**Malfunction** • Fluid temperature sensor • PCM	• Fluid temperature sensor • Harness & connector

CIRCUIT DIAGRAM


C27
PCM
Sensor ground
Sensor input
107
106
2
1
Fluid temperature sensor
1
2
Fluid temperature side connector terminal


Check fluid temperature sensor
NG
Replace
OK
Measure at the fluid temperature sensor connector
1) Disconnect the connector, and measure at the connector side.
2) Voltage between terminal 1 and ground (Ignition S/W : ON)
3) Continuity between terminal 2 and ground
OK : Continuity
OK
Check trouble symptom
Check the harness wire between connectors of fluid termperature sensor and PCM
NG
Repair
OK
Replace the PCM

Automatic Transaxle System > Troubleshooting > P0717

DIAGNOSTIC ITEM

P0717

DTC NO	DIAGNOSTIC ITEM	
P0717	PULSE GENERATOR A	- Open, short circuit -

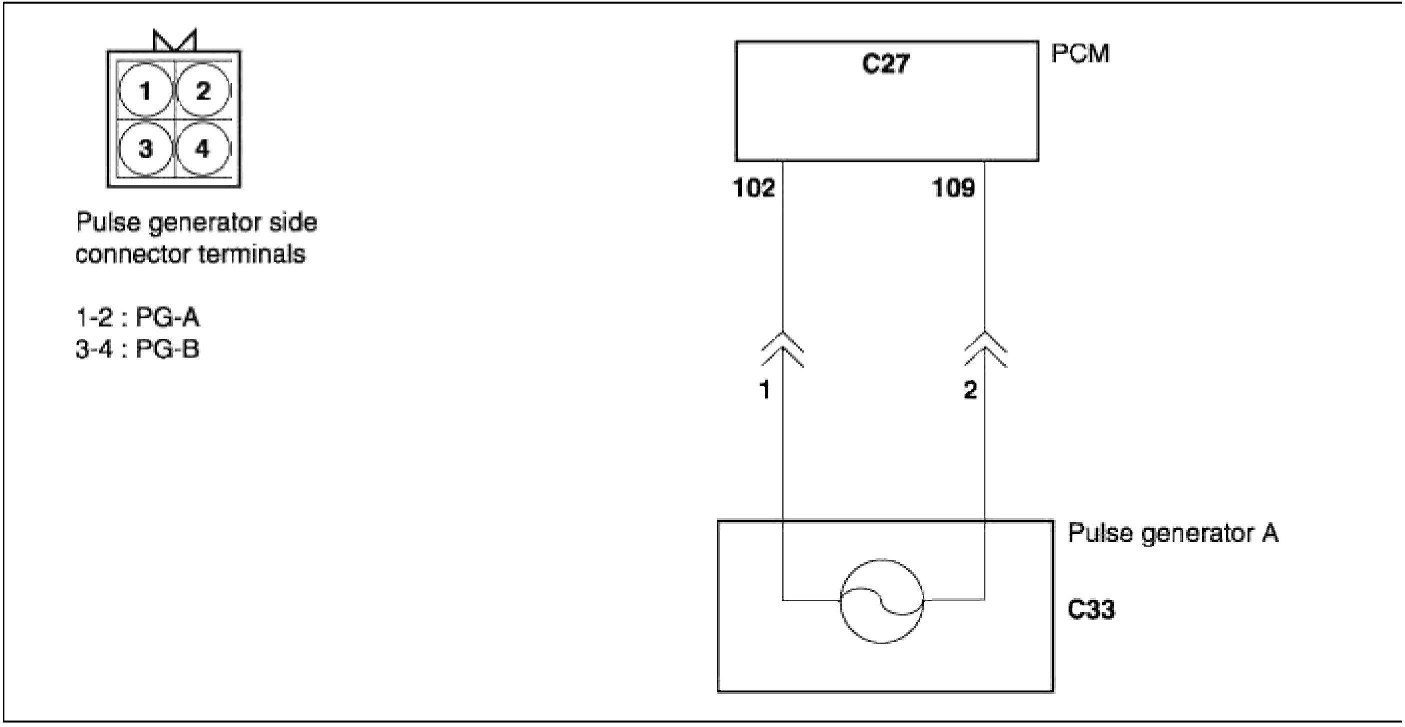
DESCRIPTION

- Detects non-operating area of damper clutch
- Detects turbine rpm for control of fluid pressure during a shift

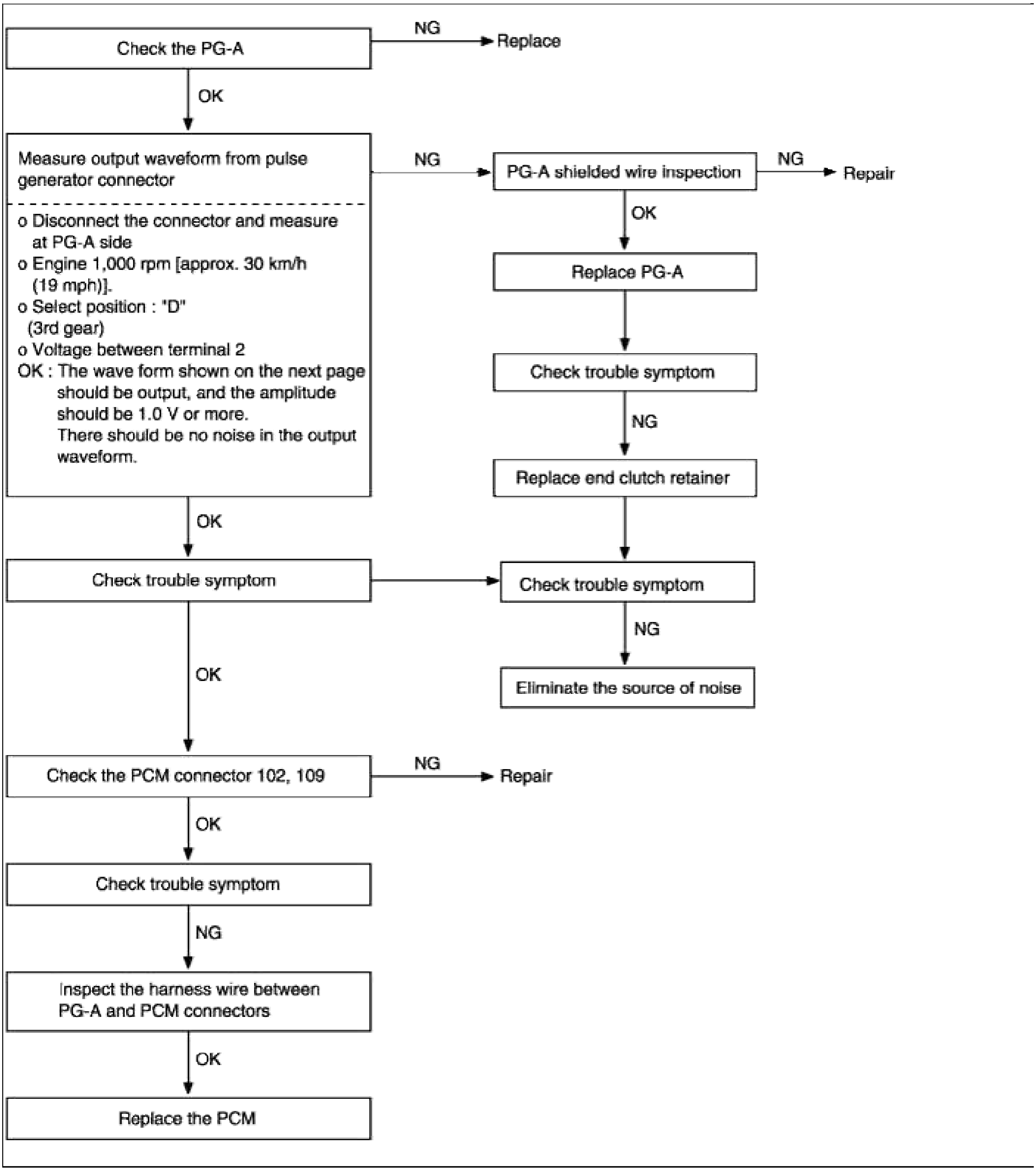
TROUBLESHOOTING FLOW

Detection condition	Possible cause	Check item
• Vehicle speed sensor speed>30km/h • Transaxle range : D, 2 or L • Engine speed>3,000rpm • Shift position : 2nd, 3rd or 4th gear	• Malfunction of PG-A • Malfunction of connector • Malfunction of PCM • Malfunction of end clutch retainer	• Harness & connector
SYMPTOM • Shift shock during 2nd and 4th gear shifting. • When code P0717 is generated, automatic transaxle hold in 3rd gear ("D" range) or 2nd gear ("2", "L" range). • Codes P0731, P0732, P0733 and P0734 may also be set.		

TROUBLESHOOTING GUIDE


1
2
3
4
Pulse generator side connector terminals
1-2 : PG-A
3-4 : PG-B
C27
PCM
102
109
1
2
Pulse generator A
C33

TROUBLESHOOTING FLOW


Check the PG-A
NG
Replace
OK
Measure output waveform from pulse generator connector
o Disconnect the connector and measure at PG-A side
o Engine 1,000 rpm [approx. 30 km/h (19 mph)].
o Select position : "D" (3rd gear)
o Voltage between terminal 2
OK : The wave form shown on the next page should be output, and the amplitude should be 1.0 V or more. There should be no noise in the output waveform.
NG
PG-A shielded wire inspection
NG
Repair
OK
Replace PG-A
Check trouble symptom
NG
Replace end clutch retainer
OK
Check trouble symptom
Check trouble symptom
NG
Eliminate the source of noise
OK
Check the PCM connector 102, 109
NG
Repair
OK
Check trouble symptom
NG
Inspect the harness wire between PG-A and PCM connectors
OK
Replace the PCM

Automatic Transaxle System > Troubleshooting > P0722

DIAGNOSTIC ITEM

P0722

DTC NO	DIAGNOSTIC ITEM	
P0722	PULSE GENERATOR B	- Open, short-

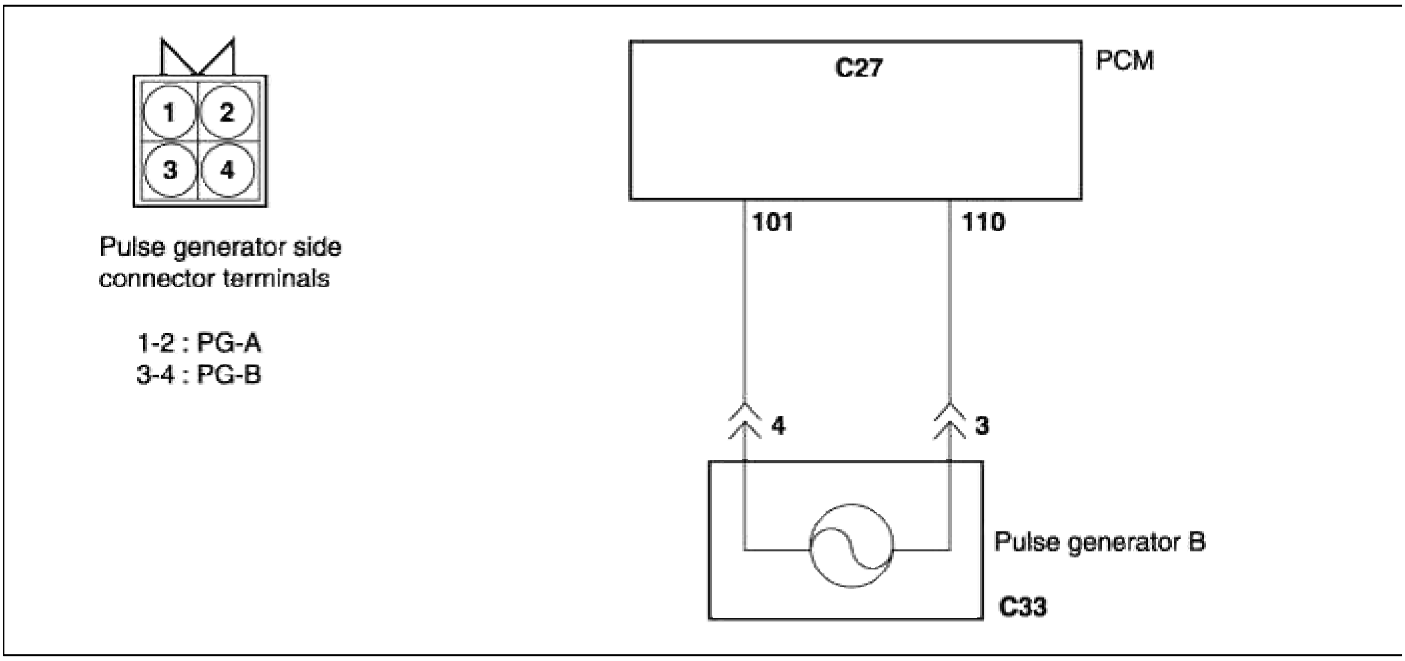
DESCRIPTION

- Detects number of revolutions of the transfer driven gear to monitor vehicle speed.

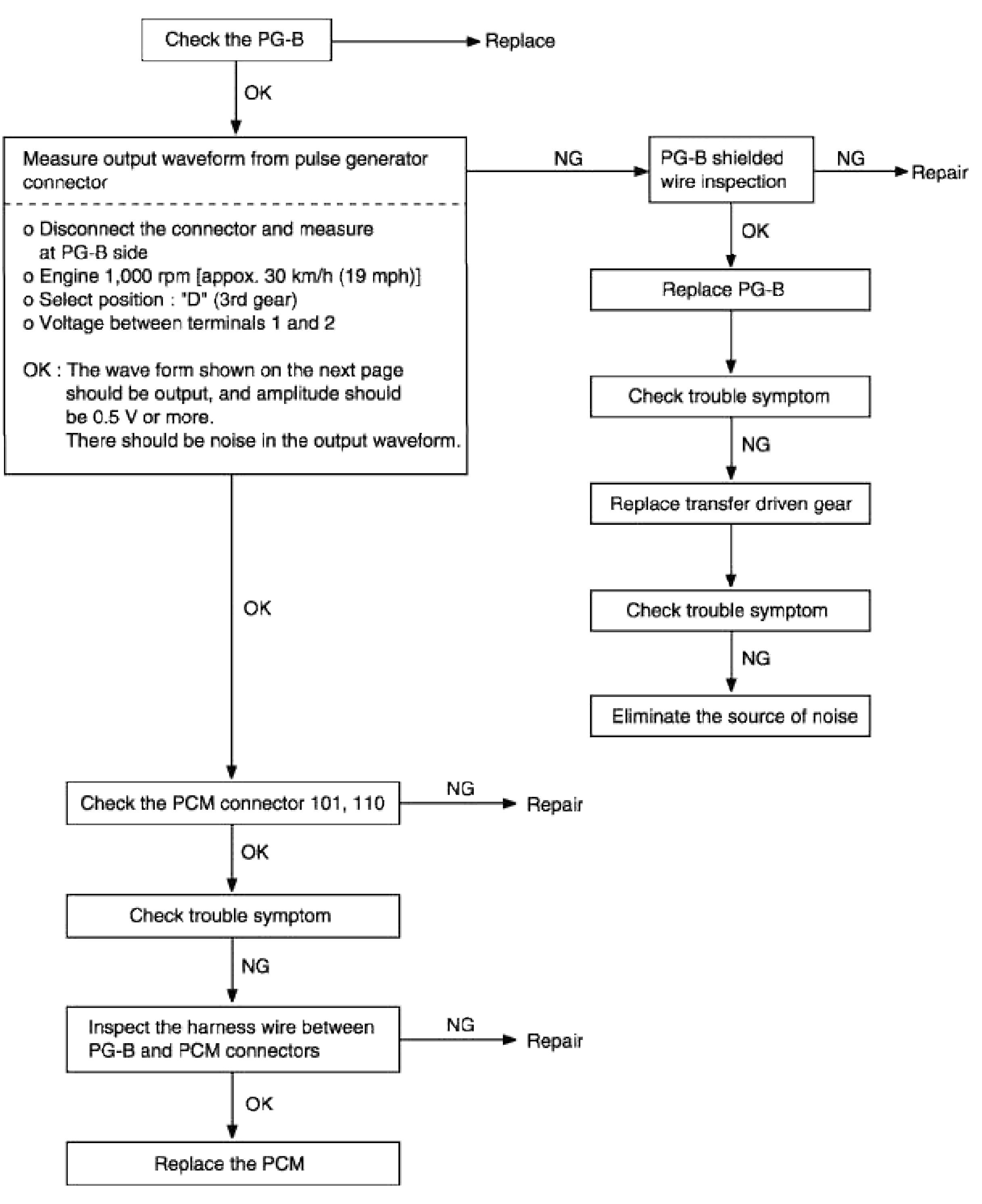
TROUBLESHOOTING FLOW

Detection condition	Possible cause	Check item
• Vehicle speed sensor speed>30 km/h • Engine speed>3,000 rpm • Shift position : 2nd, 3rd or 4th gear	• Malfunction of PG-B • Malfunction of connector • Malfunction of PCM • Malfunction of transfer driven gear	• Open in PG-B circuit • Malfunction of PG-B • Noise in signal (Poor or defective shielding) • Chattering of vehicle speed sensor
SYMPTOM • Shift shock during 2nd and 4th gear shifting • When fail-safe code P0722 is generated, automatic transaxle will hold in 3rdgear (D) or 2nd gear (2,L) • Codes P0731, P0732, P0733 and P0734 may also be set		

CIRCUIT DIAGRAM


1
2
3
4
Pulse generator side connector terminals
1-2 : PG-A
3-4 : PG-B
C27
PCM
101
110
4
3
Pulse generator B
C33

TROUBLESHOOTING FLOW


Check the PG-B
Replace
OK
Measure output waveform from pulse generator connector
o Disconnect the connector and measure at PG-B side
o Engine 1,000 rpm [appox. 30 km/h (19 mph)]
o Select position : "D" (3rd gear)
o Voltage between terminals 1 and 2
OK : The wave form shown on the next page should be output, and amplitude should be 0.5 V or more. There should be noise in the output waveform.
NG
PG-B shielded wire inspection
NG
Repair
OK
Replace PG-B
Check trouble symptom
NG
Replace transfer driven gear
Check trouble symptom
NG
Eliminate the source of noise
OK
Check the PCM connector 101, 110
NG
Repair
OK
Check trouble symptom
NG
Inspect the harness wire between PG-B and PCM connectors
NG
Repair
OK
Replace the PCM

Automatic Transaxle System > Troubleshooting > P0731

DIAGNOSTIC ITEM

P0731

DTC NO	DIAGNOSTIC ITEM	
P0731	FIRST GEAR INCORRECT RATIO	- MALFUNCTION -

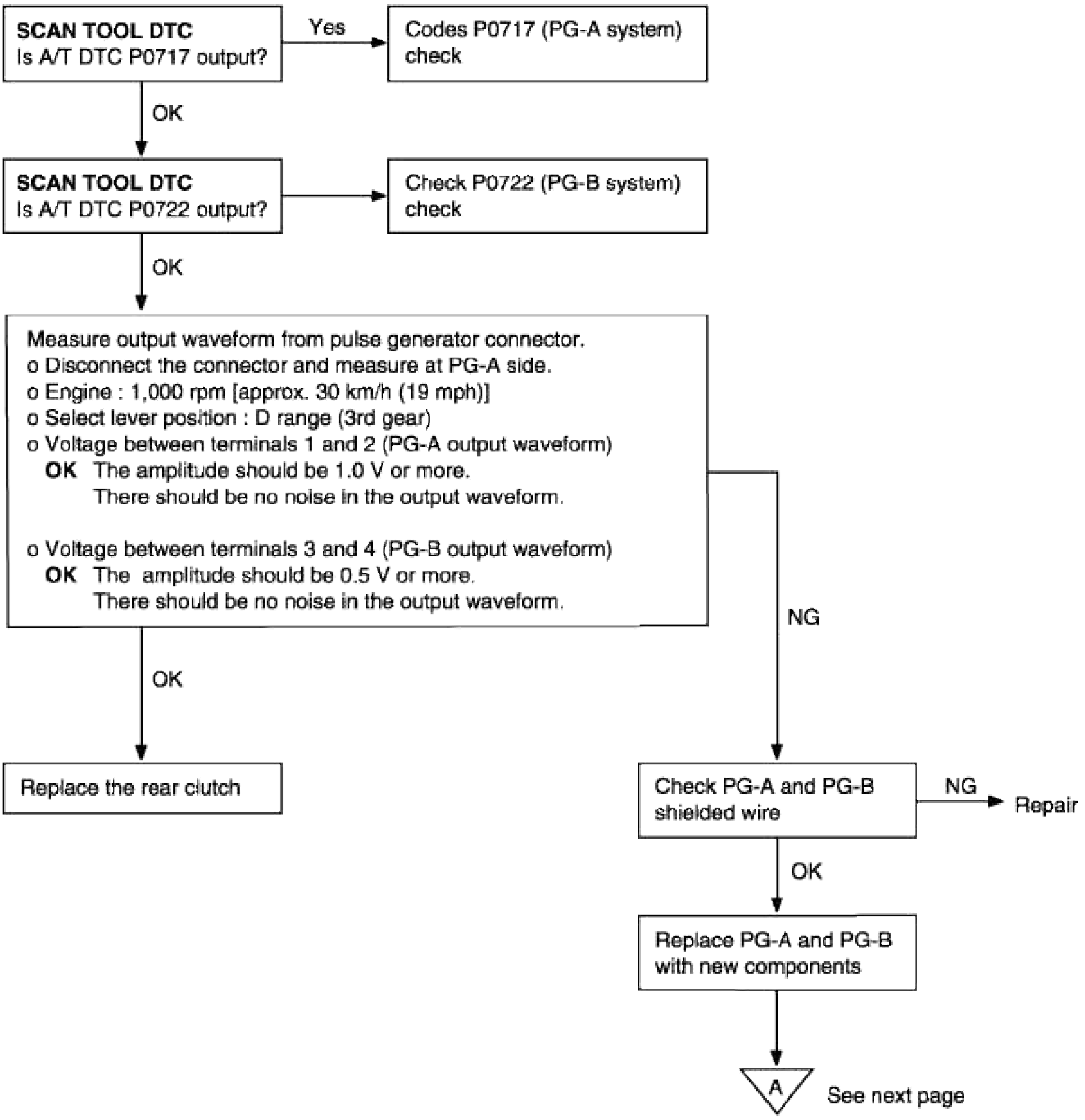
DESCRIPTION

- If the value resulting from driving the PG-A output (input shaft rotation speed) by the 1st gear ratio does not match the PG-B output (output shaft rotation speed) after 1st gear is engaged, DTC P0731 is output.

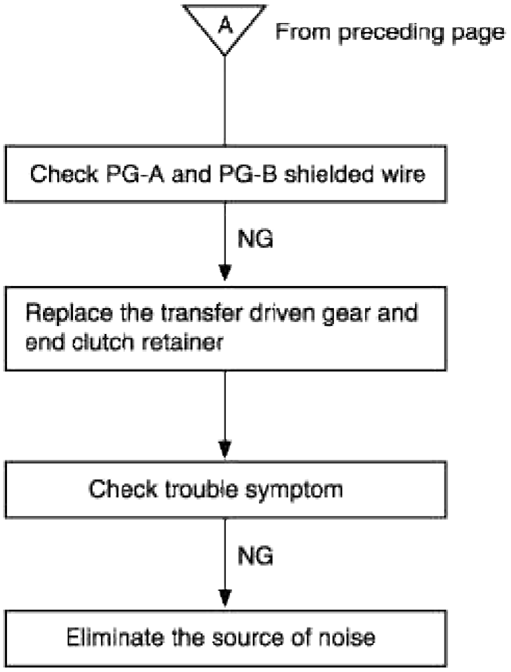
TROUBLESHOOTING FLOW

Detection condition	Possible cause	Check item
• Engine speed>400 rpm • Transfer shaft speed>900 rpm • Fluid temperature>60°C • PCM senses a signal that does not fall into the preprogrammed parameters	**Malfunction** • PG-A or PG-B • Transfer driven gear • Rear clutch • One-way clutch	• Malfunction of pulse generator circuit • Rear clutch slippage • One-way clutch slippage
SYMPTOM • Automatic transaxle will hold 3rd gear (D) or 2nd gear (2,L) • Code P0717 or P0722 may also be set (pulse generator codes)		

TROUBLESHOOTING FLOW


SCAN TOOL DTC
Is A/T DTC P0717 output?
Yes
Codes P0717 (PG-A system) check
OK
SCAN TOOL DTC
Is A/T DTC P0722 output?
Check P0722 (PG-B system) check
OK
OK
Replace the rear clutch
NG
Check PG-A and PG-B shielded wire
NG
Repair
OK
Replace PG-A and PG-B with new components
A
See next page

Measure output waveform from pulse generator connector.
- o Disconnect the connector and measure at PG-A side.
- o Engine : 1,000 rpm [approx. 30 km/h (19 mph)]
- o Select lever position : D range (3rd gear)
- o Voltage between terminals 1 and 2 (PG-A output waveform)
  OK The amplitude should be 1.0 V or more.
  There should be no noise in the output waveform.
- o Voltage between terminals 3 and 4 (PG-B output waveform)
  OK The amplitude should be 0.5 V or more.
  There should be no noise in the output waveform.


A
From preceding page
Check PG-A and PG-B shielded wire
NG
Replace the transfer driven gear and end clutch retainer
Check trouble symptom
NG
Eliminate the source of noise

Automatic Transaxle System > Troubleshooting > P0732

DIAGNOSTIC ITEM

P0732

DTC NO	DIAGNOSTIC ITEM	
P0732	SECOND GEAR SYSTEM	- MALFUNCTION -

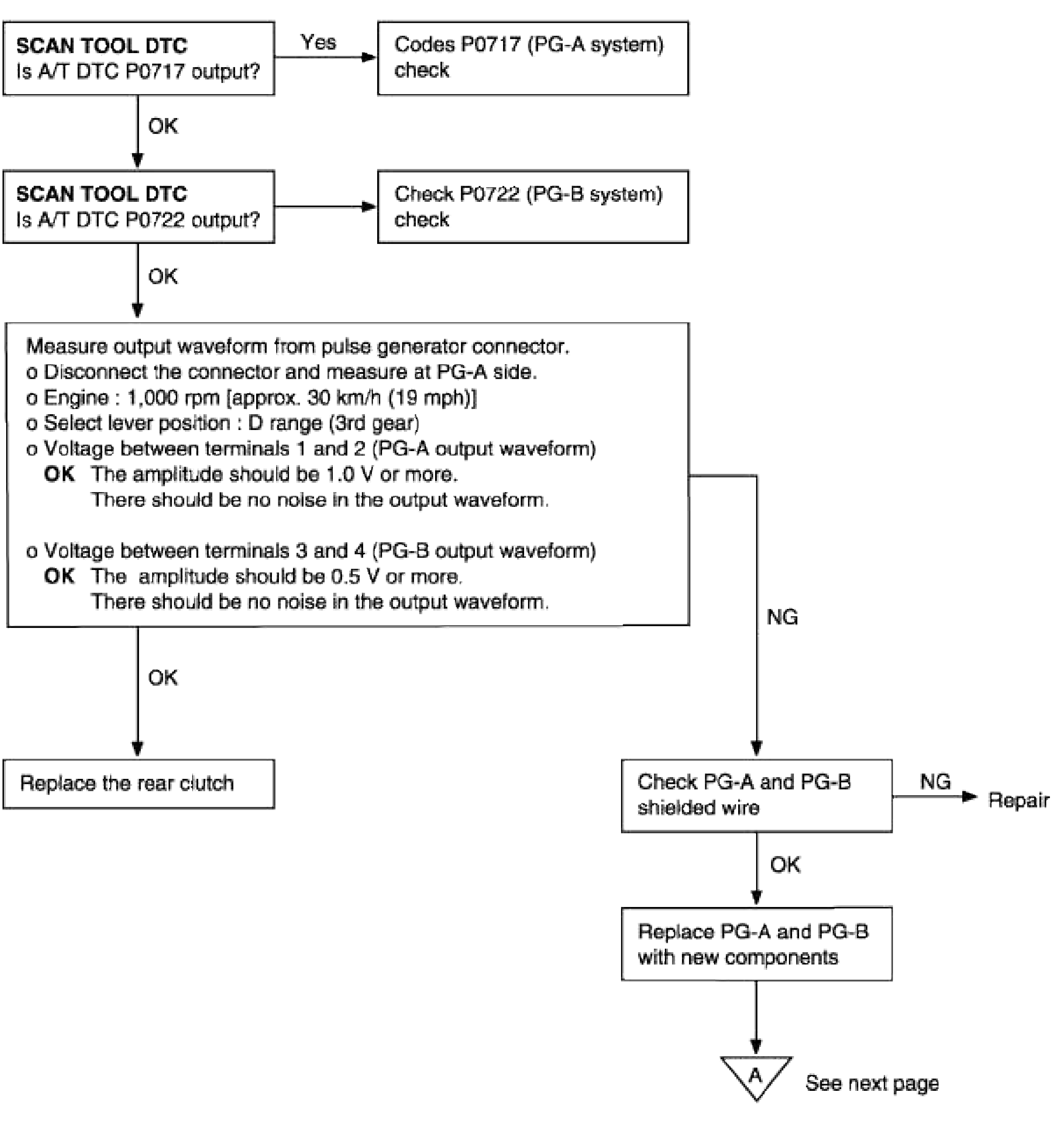
DESCRIPTION

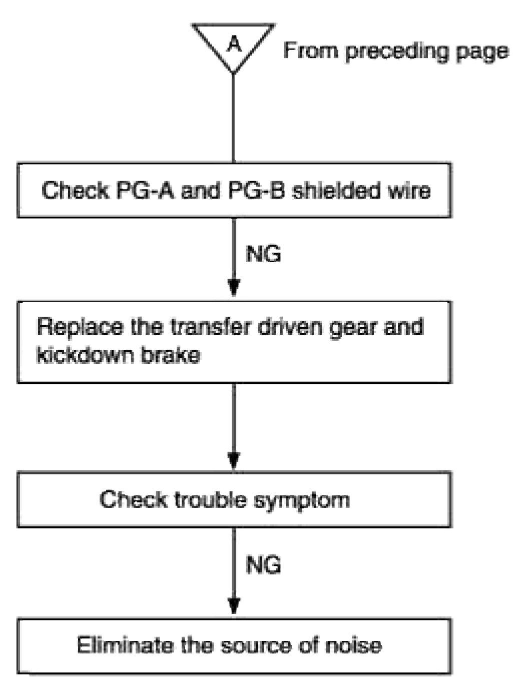
- If the value resulting from driving the PG-A output (input shaft rotation speed) by the 2nd gear ratio does not match the PG-B output (output shaft rotation speed) after 2nd gear is engaged, DTC P0732 is output.

TROUBLESHOOTING GUIDE

Detection condition	Possible cause	Check item
• If the value resulting from driving the PG-A output (input shaft rotation speed) by the 2nd gear ratio does not match the PG-B output (output shaft rotation speed) after 2nd gear is engaged, DTC P0732 is output	**Malfunction** • PG-A or PG-B • Transfer driven gear • Rear clutch • Kickdown brake	• Malfunction of pulse generator circuit • Rear clutch slippage • Kickdown brake slippage
SYMPTOM • Automatic transaxle will hold in 3rd gear (D) or 2nd gear (2,L)		

TROUBLESHOOTING FLOW


SCAN TOOL DTC
Is A/T DTC P0717 output?
Yes
Codes P0717 (PG-A system) check
OK
SCAN TOOL DTC
Is A/T DTC P0722 output?
Check P0722 (PG-B system) check
OK
Measure output waveform from pulse generator connector.
o Disconnect the connector and measure at PG-A side.
o Engine : 1,000 rpm [approx. 30 km/h (19 mph)]
o Select lever position : D range (3rd gear)
o Voltage between terminals 1 and 2 (PG-A output waveform)
OK The amplitude should be 1.0 V or more.
There should be no noise in the output waveform.
o Voltage between terminals 3 and 4 (PG-B output waveform)
OK The amplitude should be 0.5 V or more.
There should be no noise in the output waveform.
OK
NG
Replace the rear clutch
Check PG-A and PG-B shielded wire
NG
Repair
OK
Replace PG-A and PG-B with new components
A
See next page


A
From preceding page
Check PG-A and PG-B shielded wire
NG
Replace the transfer driven gear and kickdown brake
Check trouble symptom
NG
Eliminate the source of noise

Automatic Transaxle System > Troubleshooting > P0733

DIAGNOSTIC ITEM

P0733

DTC NO	DIAGNOSTIC ITEM	
P0733	THIRD GEAR SYSTEM	- MALFUNCTION -

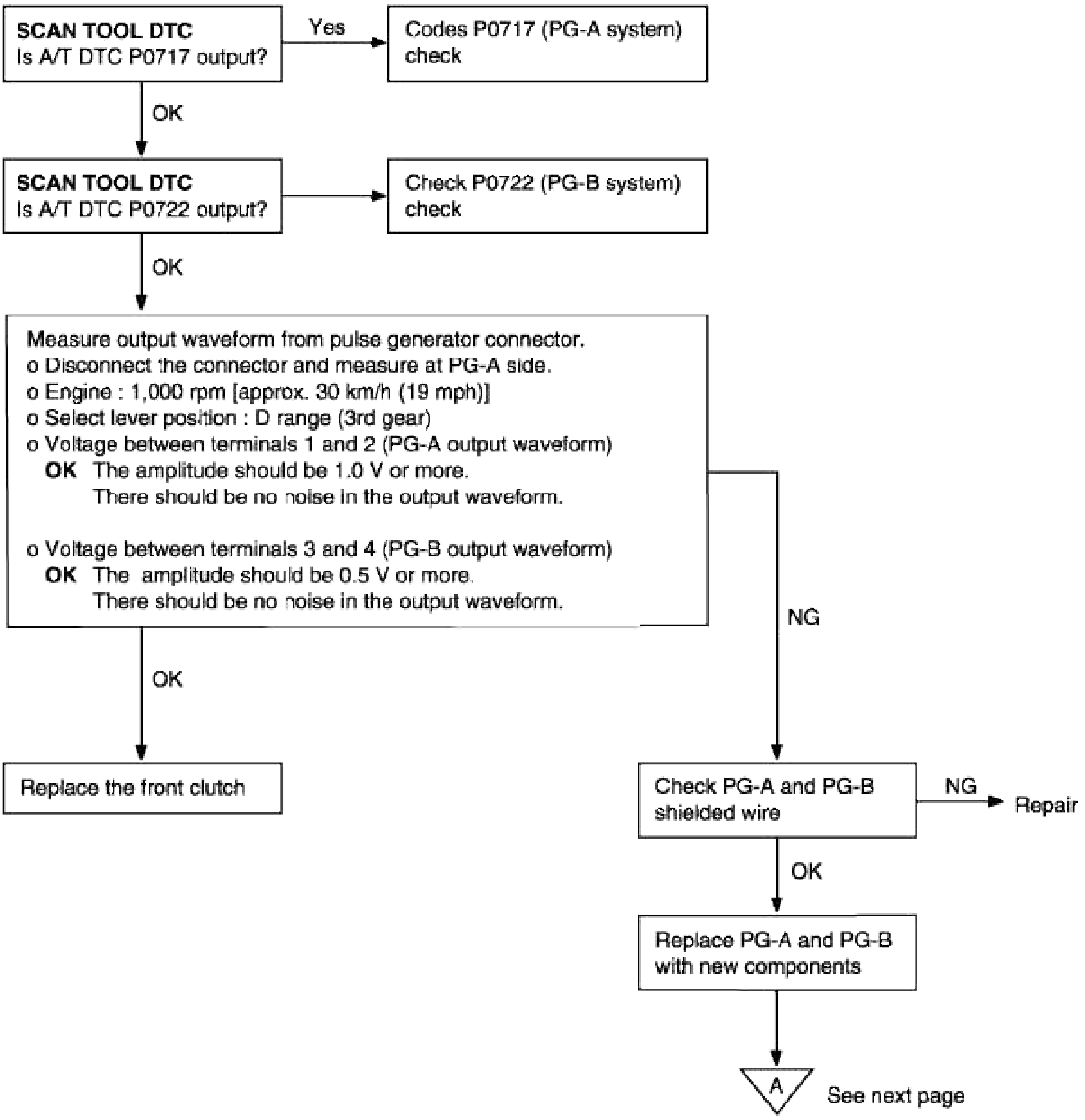
DESCRIPTION

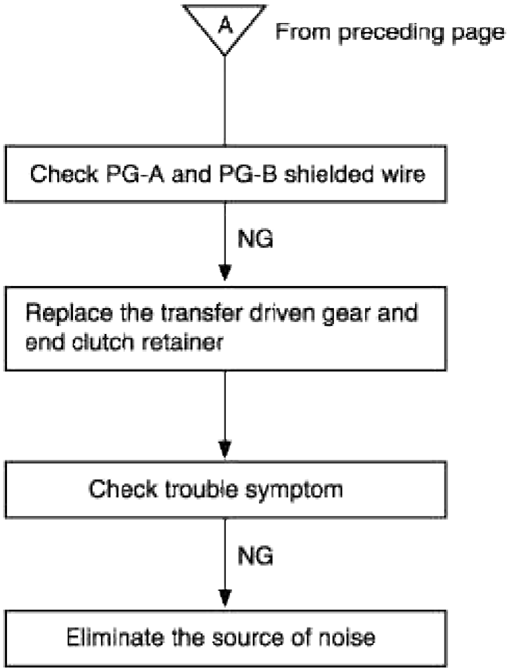
- If the value resulting from driving the PG-A output (input shaft rotation speed) by the 3rd gear ratio does not match the PG-B output (output shaft rotation speed) after 3rd gear is engaged, DTC P0733 is output.

TROUBLESHOOTING GUIDE

Detection condition	Possible cause	Check item
• Engine speed>400 rpm • Transfer shaft speed>900 rpm • Fluid temperature>60°C • PCM senses a signal that does not fall into the preprogrammed parameters	**Malfunction** • PG-A or PG-B • Transfer driven gear • End clutch retainer • Front clutch	• Malfunction of pulse generator circuit • Rear clutch slippage • Front clutch slippage
SYMPTOM • Automatic transaxle will hold 3rd gear (D) or 2nd gear (2,L) when code P0731, P0732, P0733,P0734 is output • Code P0717 or P0722 may also be set (pulse generator codes)		

TROUBLESHOOTING FLOW


SCAN TOOL DTC
Is A/T DTC P0717 output?
Yes
Codes P0717 (PG-A system) check
OK
SCAN TOOL DTC
Is A/T DTC P0722 output?
Check P0722 (PG-B system) check
OK
Measure output waveform from pulse generator connector.
o Disconnect the connector and measure at PG-A side.
o Engine : 1,000 rpm [approx. 30 km/h (19 mph)]
o Select lever position : D range (3rd gear)
o Voltage between terminals 1 and 2 (PG-A output waveform)
OK The amplitude should be 1.0 V or more.
There should be no noise in the output waveform.
o Voltage between terminals 3 and 4 (PG-B output waveform)
OK The amplitude should be 0.5 V or more.
There should be no noise in the output waveform.
OK
NG
Replace the front clutch
Check PG-A and PG-B shielded wire
NG
Repair
OK
Replace PG-A and PG-B with new components
A
See next page


A
From preceding page
Check PG-A and PG-B shielded wire
NG
Replace the transfer driven gear and end clutch retainer
Check trouble symptom
NG
Eliminate the source of noise

Automatic Transaxle System > Troubleshooting > P0734

DIAGNOSTIC ITEM

P0734

DTC NO	DIAGNOSTIC ITEM	
P0734	FOURTH GEAR SYSTEM	- MALFUNCTION -

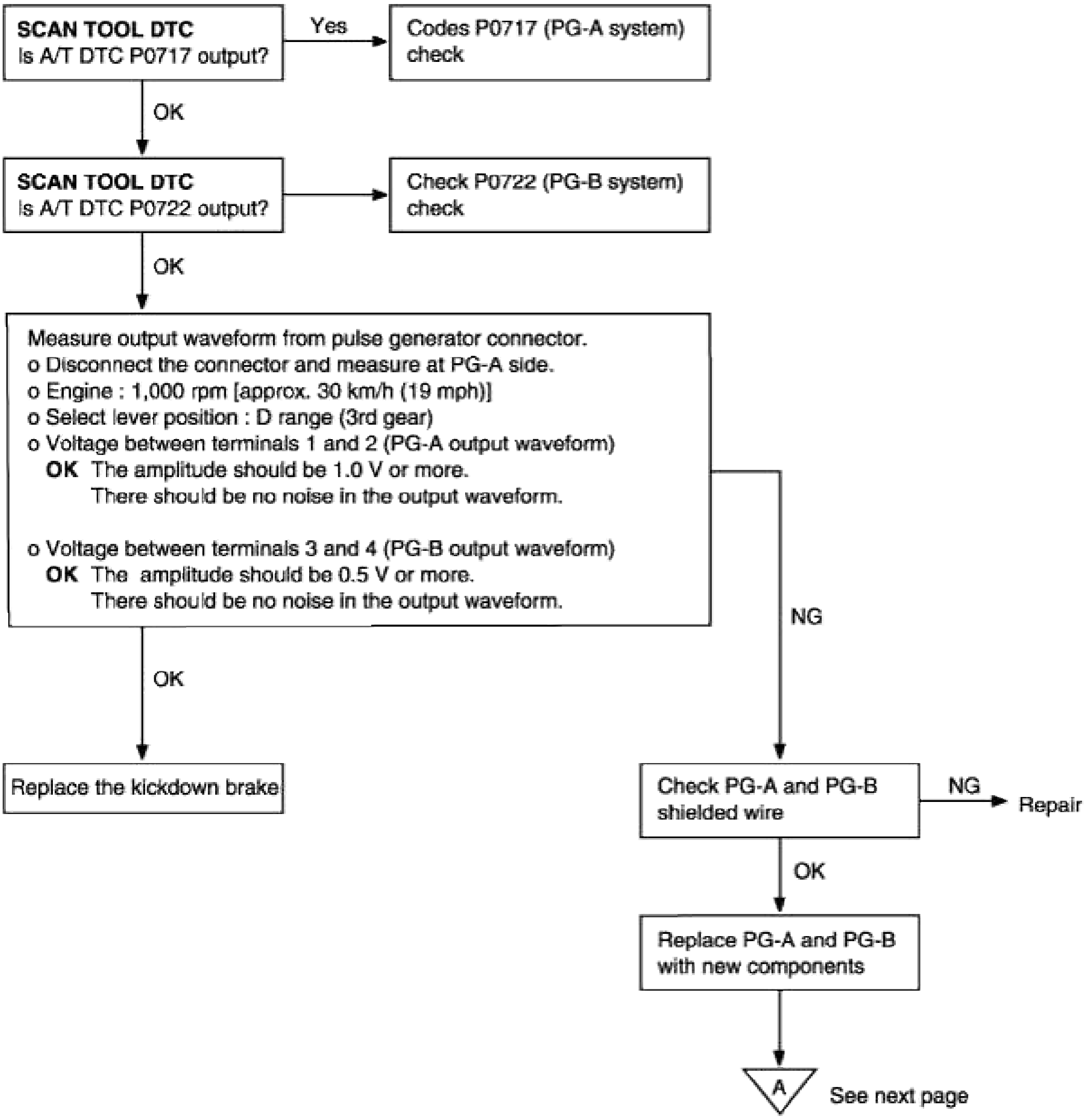
DESCRIPTION

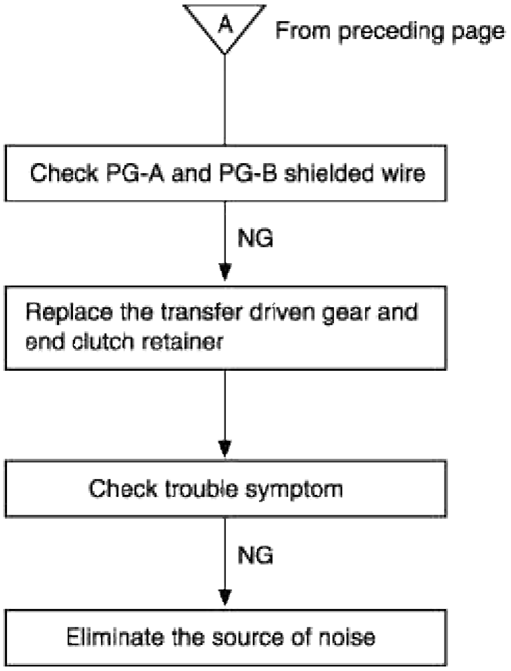
- If the value resulting from driving the PG-A output (input shaft rotation speed) by the 4th gear ratio does not match the PG-B output (output shaft rotation speed) after 4th gear is engaged, DTC P0734 is output.

TROUBLESHOOTING GUIDE

Detection condition	Possible cause	Check item
• Engine speed>400 rpm • Transfer shaft speed >900 rpm • Fluid temperture>60°C • PCM senses a signal that does not fall into the preprogrammed parameters.	**Malfunction** • PG-B • Transfer driven gear • End clutch retainer • Kickdown brake • End clutch	• Malfunction of pulse generator circuit • Kickdown brake slippage
SYMPTOM • Automatic transaxle will hold in 3rd gear (D) or 2nd gear (2,L) when code P0731, P0732, P0733, P0734 is output. • Code P0717 or P0722 may also be set (pulse generator codes).		

TROUBLESHOOTING FLOW


SCAN TOOL DTC
Is A/T DTC P0717 output?
Yes
Codes P0717 (PG-A system) check
OK
SCAN TOOL DTC
Is A/T DTC P0722 output?
Check P0722 (PG-B system) check
OK
Measure output waveform from pulse generator connector.
o Disconnect the connector and measure at PG-A side.
o Engine : 1,000 rpm [approx. 30 km/h (19 mph)]
o Select lever position : D range (3rd gear)
o Voltage between terminals 1 and 2 (PG-A output waveform)
OK The amplitude should be 1.0 V or more.
There should be no noise in the output waveform.
o Voltage between terminals 3 and 4 (PG-B output waveform)
OK The amplitude should be 0.5 V or more.
There should be no noise in the output waveform.
NG
OK
Replace the kickdown brake
Check PG-A and PG-B shielded wire
NG
Repair
OK
Replace PG-A and PG-B with new components
A
See next page


A
From preceding page
Check PG-A and PG-B shielded wire
NG
Replace the transfer driven gear and end clutch retainer
Check trouble symptom
NG
Eliminate the source of noise

Automatic Transaxle System > Troubleshooting > P0741

DIAGNOSTIC ITEM

P0743/P0742/P0741

DTC NO	DIAGNOSTIC ITEM	
P0743	DAMPER CLUTCH CONTROL SOLENOID VALVE	- Open, Short circuit -
P0742	DAMPER CLUTCH SYSTEM	- Stuck ON -
P0741	DAMPER CLUTCH SYSTEM	- Stuck OFF -

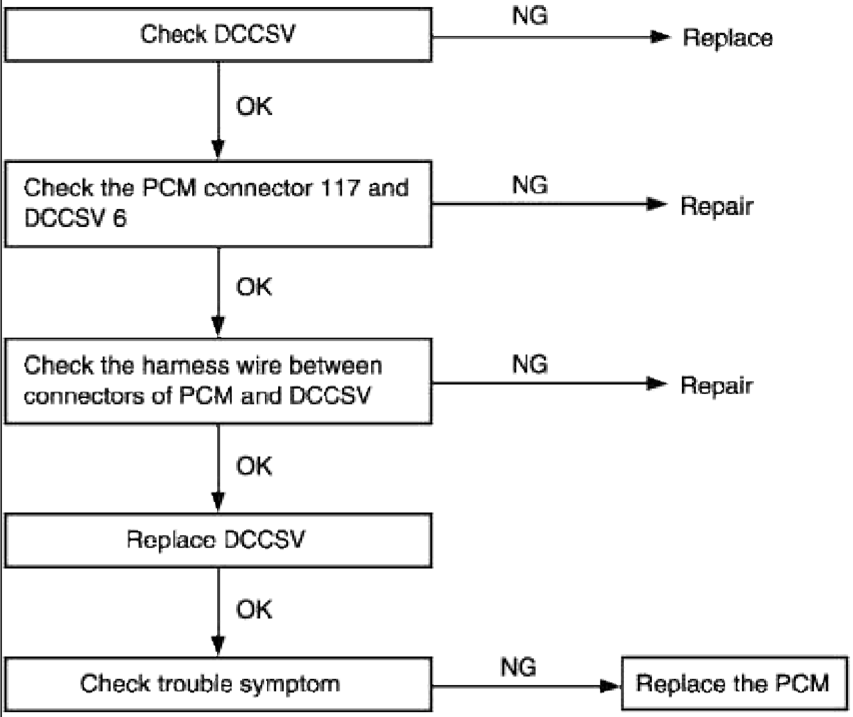
DESCRIPTION

- Controls fluid pressure that is acting on the damper clutch control valve through Pulse Width Modulation signals from the PCM to control the operation of the damper clutch.
- If damper clutch solenoid drive duty continues at 100% for 4 sec. or more, there is an abnormality in the damper clutch control system at DTC P0743 is output.

TROUBLESHOOTING FLOW

Detection condition	Possible cause	Check item
• IG S/W "ON" or start release • PCM senses an open • Short in DCCSV circuit	• Malfunction of connector • Malfunction of PCM	• Open/short in DCCSV circuit • Malfunction of DCCSV
SYMPTOM • Excessive fuel consumption • Poor performance		

TROUBLESHOOTING FLOW


Check DCCSV
NG
Replace
OK
Check the PCM connector 117 and DCCSV 6
NG
Repair
OK
Check the harness wire between connectors of PCM and DCCSV
NG
Repair
OK
Replace DCCSV
OK
Check trouble symptom
NG
Replace the PCM

Automatic Transaxle System > Troubleshooting > P0742

DIAGNOSTIC ITEM

P0743/P0742/P0741

DTC NO	DIAGNOSTIC ITEM	
P0743	DAMPER CLUTCH CONTROL SOLENOID VALVE	- Open, Short circuit -
P0742	DAMPER CLUTCH SYSTEM	- Stuck ON -
P0741	DAMPER CLUTCH SYSTEM	- Stuck OFF -

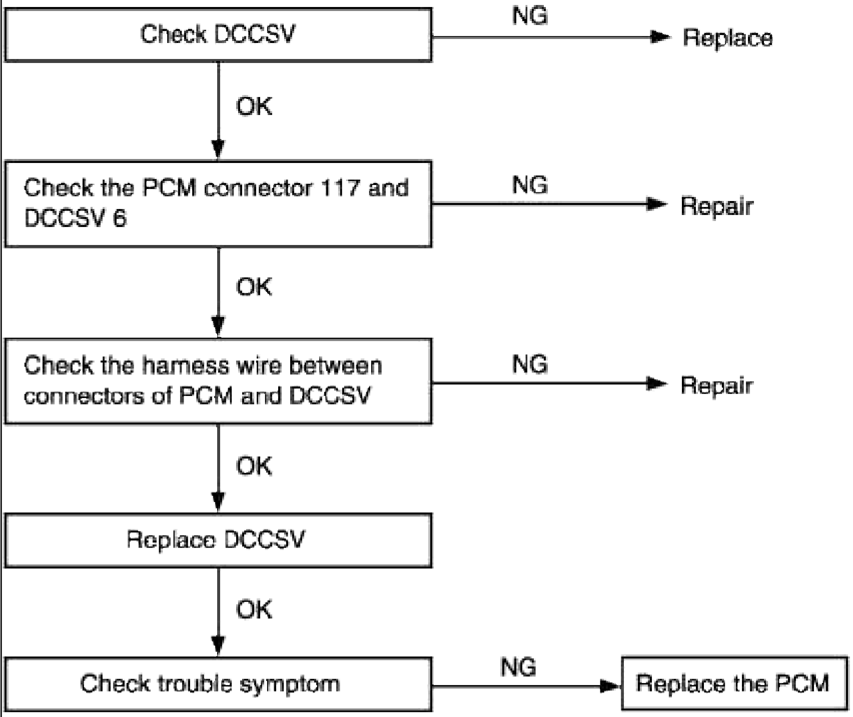
DESCRIPTION

- Controls fluid pressure that is acting on the damper clutch control valve through Pulse Width Modulation signals from the PCM to control the operation of the damper clutch.
- If damper clutch solenoid drive duty continues at 100% for 4 sec. or more, there is an abnormality in the damper clutch control system at DTC P0743 is output.

TROUBLESHOOTING FLOW

Detection condition	Possible cause	Check item
• IG S/W "ON" or start release • PCM senses an open • Short in DCCSV circuit	• Malfunction of connector • Malfunction of PCM	• Open/short in DCCSV circuit • Malfunction of DCCSV
SYMPTOM • Excessive fuel consumption • Poor performance		

TROUBLESHOOTING FLOW


Check DCCSV
NG
Replace
OK
Check the PCM connector 117 and DCCSV 6
NG
Repair
OK
Check the harness wire between connectors of PCM and DCCSV
NG
Repair
OK
Replace DCCSV
OK
Check trouble symptom
NG
Replace the PCM

Automatic Transaxle System > Troubleshooting > P0743

DIAGNOSTIC ITEM

P0743/P0742/P0741

DTC NO	DIAGNOSTIC ITEM	
P0743	DAMPER CLUTCH CONTROL SOLENOID VALVE	- Open, Short circuit -
P0742	DAMPER CLUTCH SYSTEM	- Stuck ON -
P0741	DAMPER CLUTCH SYSTEM	- Stuck OFF -

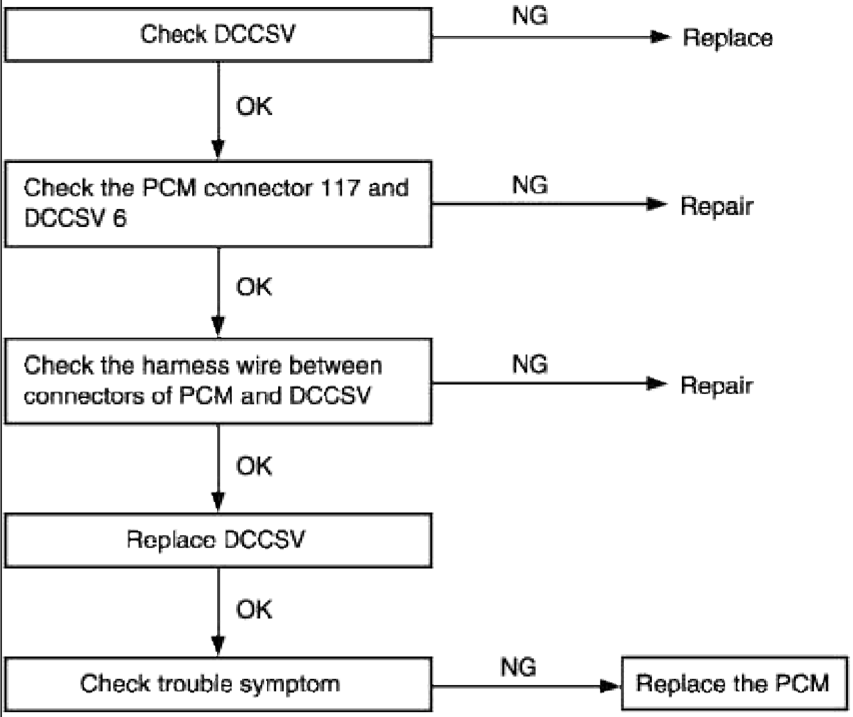
DESCRIPTION

- Controls fluid pressure that is acting on the damper clutch control valve through Pulse Width Modulation signals from the PCM to control the operation of the damper clutch.
- If damper clutch solenoid drive duty continues at 100% for 4 sec. or more, there is an abnormality in the damper clutch control system at DTC P0743 is output.

TROUBLESHOOTING FLOW

Detection condition	Possible cause	Check item
• IG S/W "ON" or start release • PCM senses an open • Short in DCCSV circuit	• Malfunction of connector • Malfunction of PCM	• Open/short in DCCSV circuit • Malfunction of DCCSV
SYMPTOM • Excessive fuel consumption • Poor performance		

TROUBLESHOOTING FLOW


Check DCCSV
NG
Replace
OK
Check the PCM connector 117 and DCCSV 6
NG
Repair
OK
Check the harness wire between connectors of PCM and DCCSV
NG
Repair
OK
Replace DCCSV
OK
Check trouble symptom
NG
Replace the PCM

Automatic Transaxle System > Troubleshooting > P0745

DIAGNOSTIC ITEM

P0745

DTC NO	DIAGNOSTIC ITEM	
P0745	PRESSURE CONTROL SOLENOID VALVE-A	- Open -, - Short circuit -

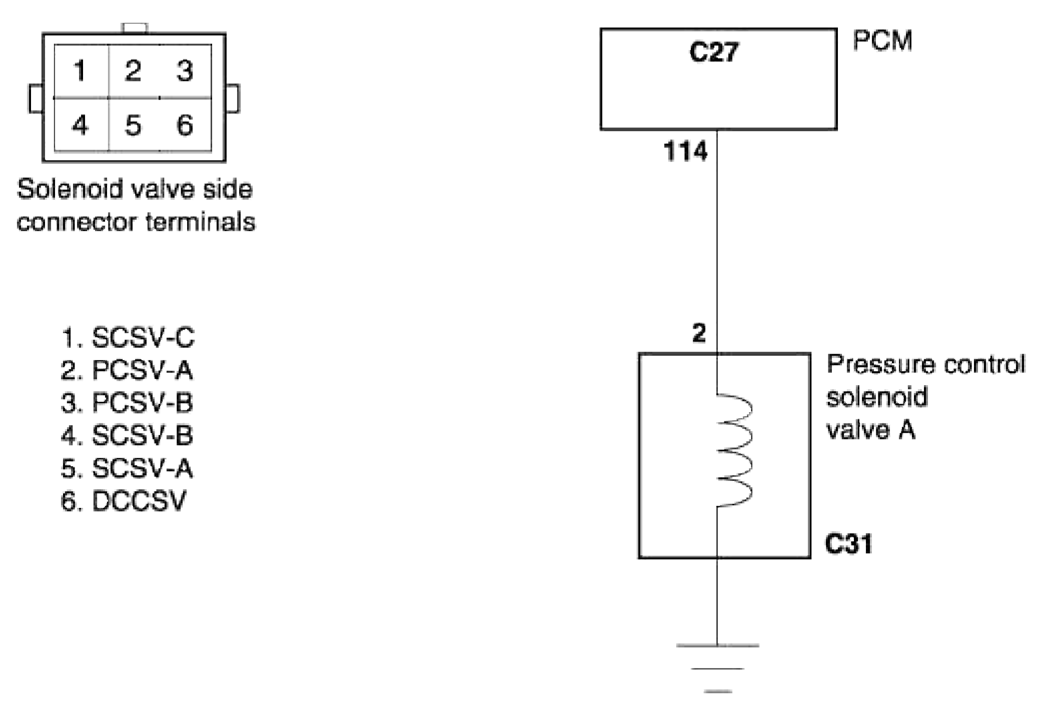
DESCRIPTION

- Controls fluid pressure that is acting on the pressure control valve-A (PCV-A) through Pulse Width Modulation signals from the PCM to control pressure during a shift.

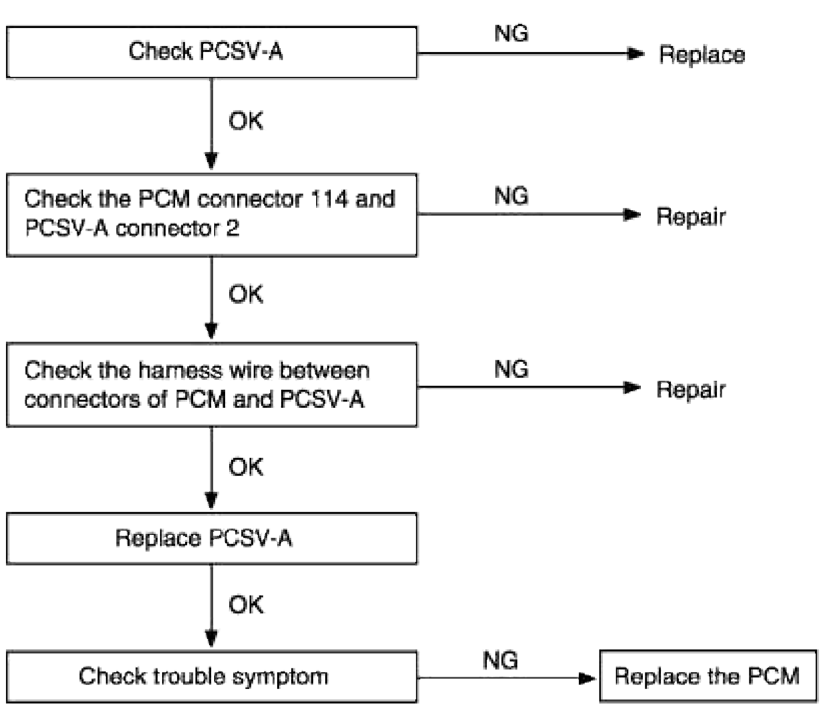
TROUBLESHOOTING FLOW

Detection condition	Possible cause	Check item
• IG S/W "ON" or start release • PCM senses an open • Short in the PCSV-A circuit	• Malfunction of PCSV-A • Malfunction of connector • Malfunction of PCM	• Open/short in PCSV-A circuit • Malfunction of PCSV-A
SYMPTOM • Shock felt as transaxle is engaged • Shift shock is felt as transaxle shifts through gears • Abrupt increase of engine rpm • When code P0745 is generated for the 4th time, automatic transaxle will hold 3rd gear (D) or 2nd gear (2,L)		

CIRCUIT DIAGRAM


1 2 3
4 5 6
Solenoid valve side connector terminals
1. SCSV-C
2. PCSV-A
3. PCSV-B
4. SCSV-B
5. SCSV-A
6. DCCSV
C27
PCM
114
2
Pressure control solenoid valve A
C31

TROUBLESHOOTING FLOW


Check PCSV-A
NG
Replace
OK
Check the PCM connector 114 and PCSV-A connector 2
NG
Repair
OK
Check the harness wire between connectors of PCM and PCSV-A
NG
Repair
OK
Replace PCSV-A
OK
Check trouble symptom
NG
Replace the PCM

Automatic Transaxle System > Troubleshooting > P0750

DIAGNOSTIC ITEM

P0750

DTC NO	DIAGNOSTIC ITEM	
P0750	SHIFT CONTROL SOLENOID VALVE A	- Open -, - Short circuit -

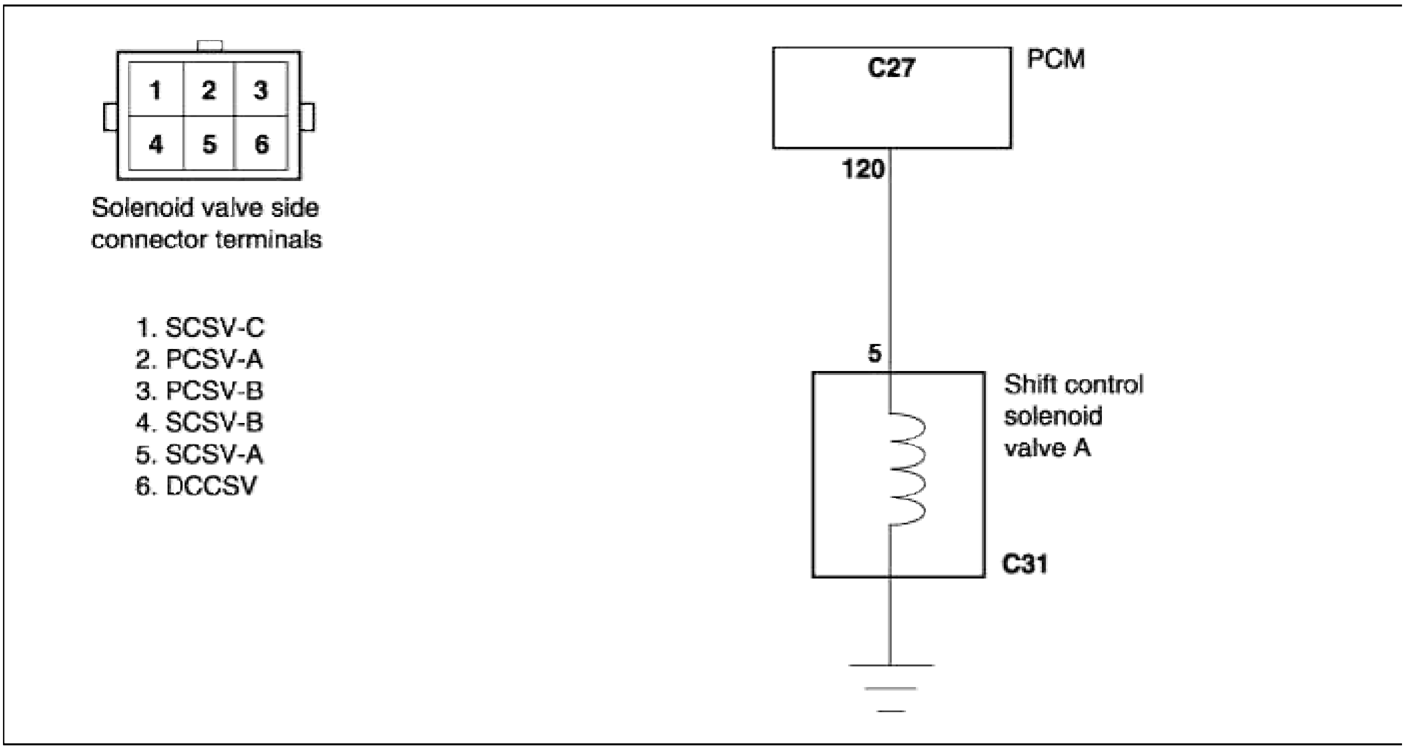
DESCRIPTION

- Control fluid pressure that is acting on the shift control valve (SCV) through ON/OFF signals from the PCM to control shifting.

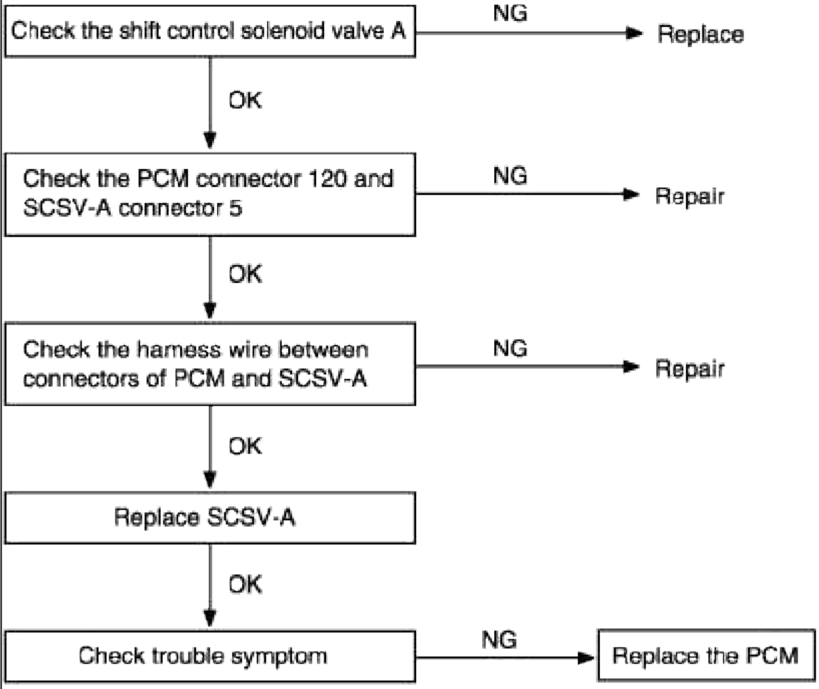
TROUBLESHOOTING FLOW

Detection condition	Possible cause	Check item
• IG S/W "ON" or start release • PCM senses an open/short in the SCSV-A	• Malfunction of PG-A • Malfunction of connector • Malfunction of PCM	• Open/short in SCSV-A circuit • Malfunction of SCSV-A
SYMPTOM • Automatic transaxle will hold 3rd gear when code P0750 is generated.		

CIRCUIT DIAGRAM


1
2
3
4
5
6
Solenoid valve side connector terminals
1. SCSV-C
2. PCSV-A
3. PCSV-B
4. SCSV-B
5. SCSV-A
6. DCCSV
C27
PCM
120
5
Shift control solenoid valve A
C31

TROUBLESHOOTING FLOW


Check the shift control solenoid valve A
NG
Replace
OK
Check the PCM connector 120 and SCSV-A connector 5
NG
Repair
OK
Check the harness wire between connectors of PCM and SCSV-A
NG
Repair
OK
Replace SCSV-A
OK
Check trouble symptom
NG
Replace the PCM

Automatic Transaxle System > Troubleshooting > P0755

DIAGNOSTIC ITEM

P0755

DTC NO	DIAGNOSTIC ITEM	
P0755	SHIFT CONTROL SOLENOID VALVE B	- Open -, - Short circuit -

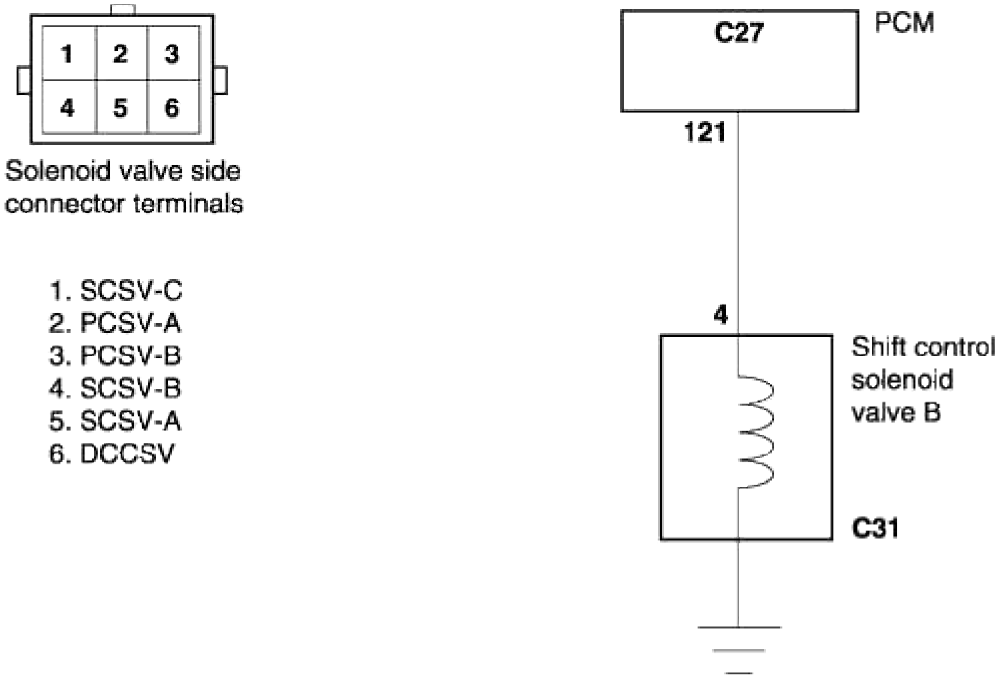
DESCRIPTION

- Controls fluid pressure that is acting on the shift control valve (SCV) through ON/OFF signals from the PCM to control shifting.
- If resistance value of SCSV-B is too high or low, P0755 is output. (open or short circuit).

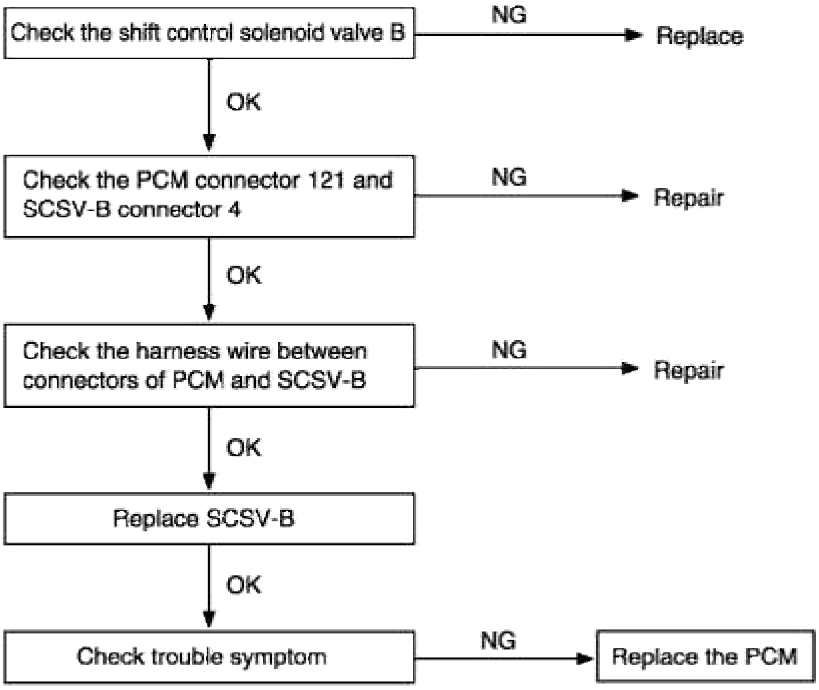
TROUBLESHOOTING FLOW

Detection condition	Possible cause	Check item
• IG S/W "ON" or start release • PCM senses an open/short in the SCSV-B	• Malfunction of SCSV-B • Malfunction of connector • Malfunction of PCM	• Open/short in SCSV-B circuit • Malfunction of SCSV-B
SYMPTOM • Automatic transaxle will hold 3rd gear when code P0755 is generated.		

CIRCUIT DIAGRAM


1
2
3
4
5
6
Solenoid valve side connector terminals
1. SCSV-C
2. PCSV-A
3. PCSV-B
4. SCSV-B
5. SCSV-A
6. DCCSV
C27
PCM
121
4
Shift control solenoid valve B
C31

TROUBLESHOOTING FLOW


Check the shift control solenoid valve B
NG
Replace
OK
Check the PCM connector 121 and SCSV-B connector 4
NG
Repair
OK
Check the harness wire between connectors of PCM and SCSV-B
NG
Repair
OK
Replace SCSV-B
OK
Check trouble symptom
NG
Replace the PCM

Automatic Transaxle System > Troubleshooting > P0760

DIAGNOSTIC ITEM

P0760

DTC NO	DIAGNOSTIC ITEM	
P0760	SHIFT CONTROL SOLENOID VALVE C	- Open -, - Short circuit -

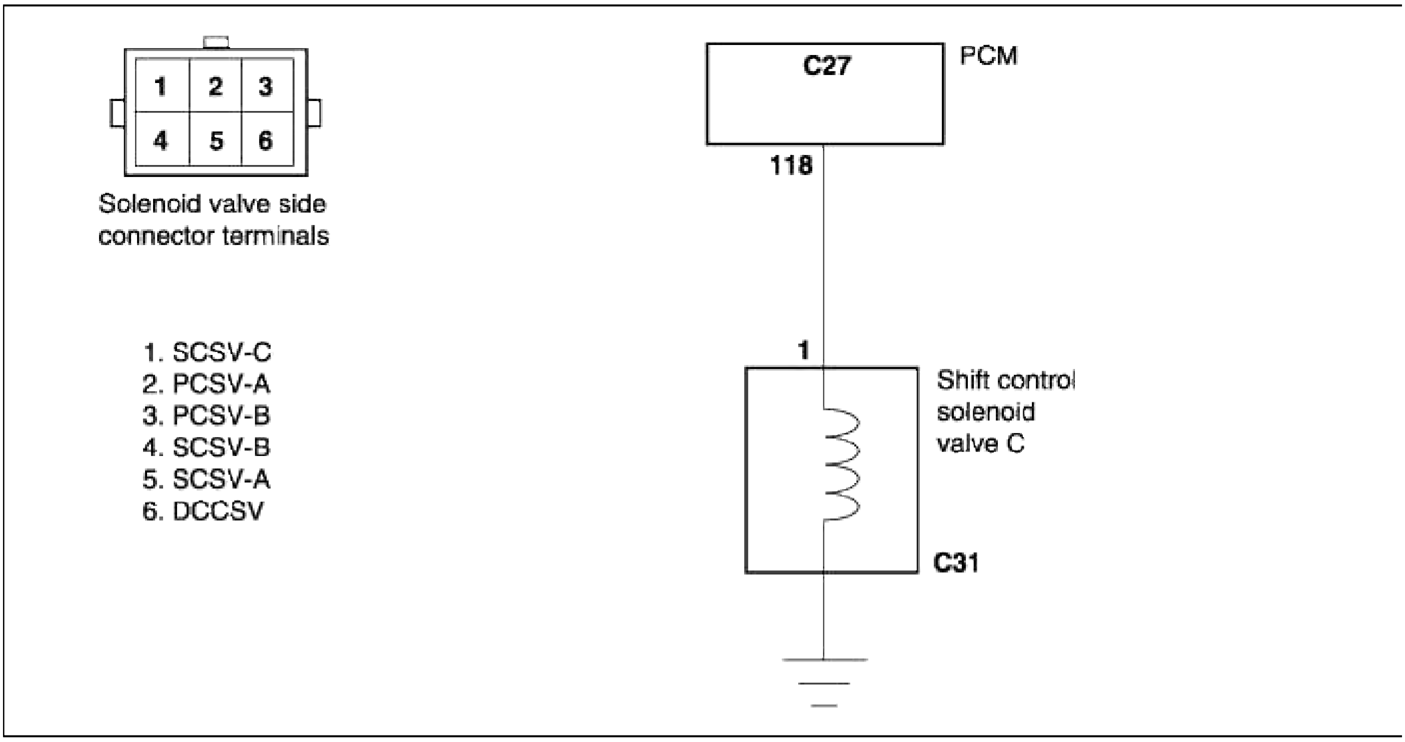
DESCRIPTION

- Controls fluid pressure that is acting on the control switch valve (CSV) through ON/OFF signals from the PCM to control shifting.
- If resistance value of SCSV-C is high, P0760 is output. (open circuit).

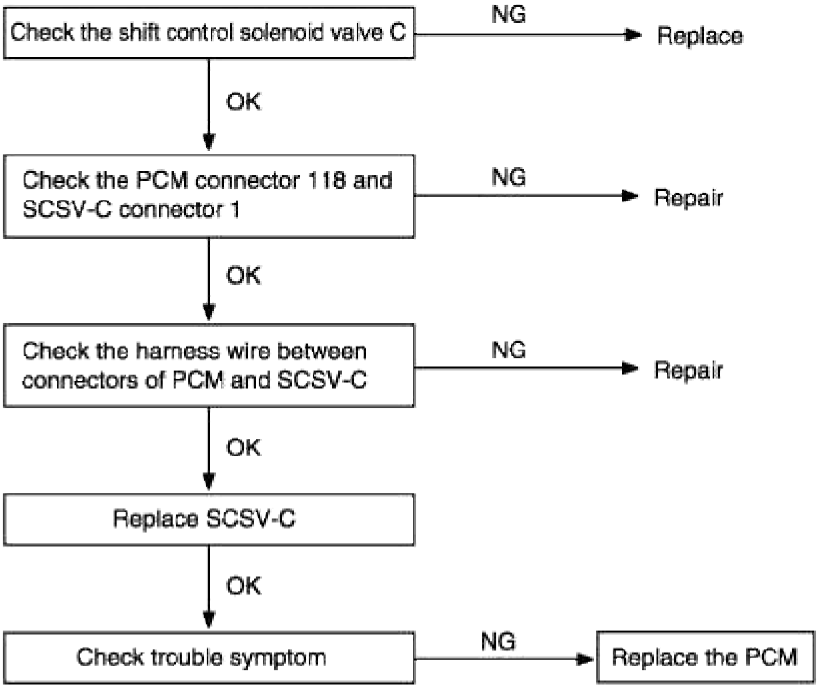
TROUBLESHOOTING FLOW

Detection condition	Possible cause	Check item
• IG S/W "ON" or start release • PCM senses an open/short in the SCSV-C	• Malfunction of SCSV-C • Malfunction of connector • Malfunction of PCM	• Open/short in SCSV-C circuit • Malfunction of SCSV-C
SYMPTOM • Automatic transaxle will hold 3rd gear when code P0760 is generated.		

CIRCUIT DIAGRAM


1
2
3
4
5
6
Solenoid valve side connector terminals
1. SCSV-C
2. PCSV-A
3. PCSV-B
4. SCSV-B
5. SCSV-A
6. DCCSV
C27
PCM
118
1
Shift control solenoid valve C
C31

TROUBLESHOOTING FLOW


Check the shift control solenoid valve C
NG
Replace
OK
Check the PCM connector 118 and SCSV-C connector 1
NG
Repair
OK
Check the harness wire between connectors of PCM and SCSV-C
NG
Repair
OK
Replace SCSV-C
OK
Check trouble symptom
NG
Replace the PCM

Automatic Transaxle System > Troubleshooting > P0765

DIAGNOSTIC ITEM

P0775

DTC NO	DIAGNOSTIC ITEM	
P0775	PRESSURE CONTROL SOLENOID VALVE-B	- Open -, - Short circuit -

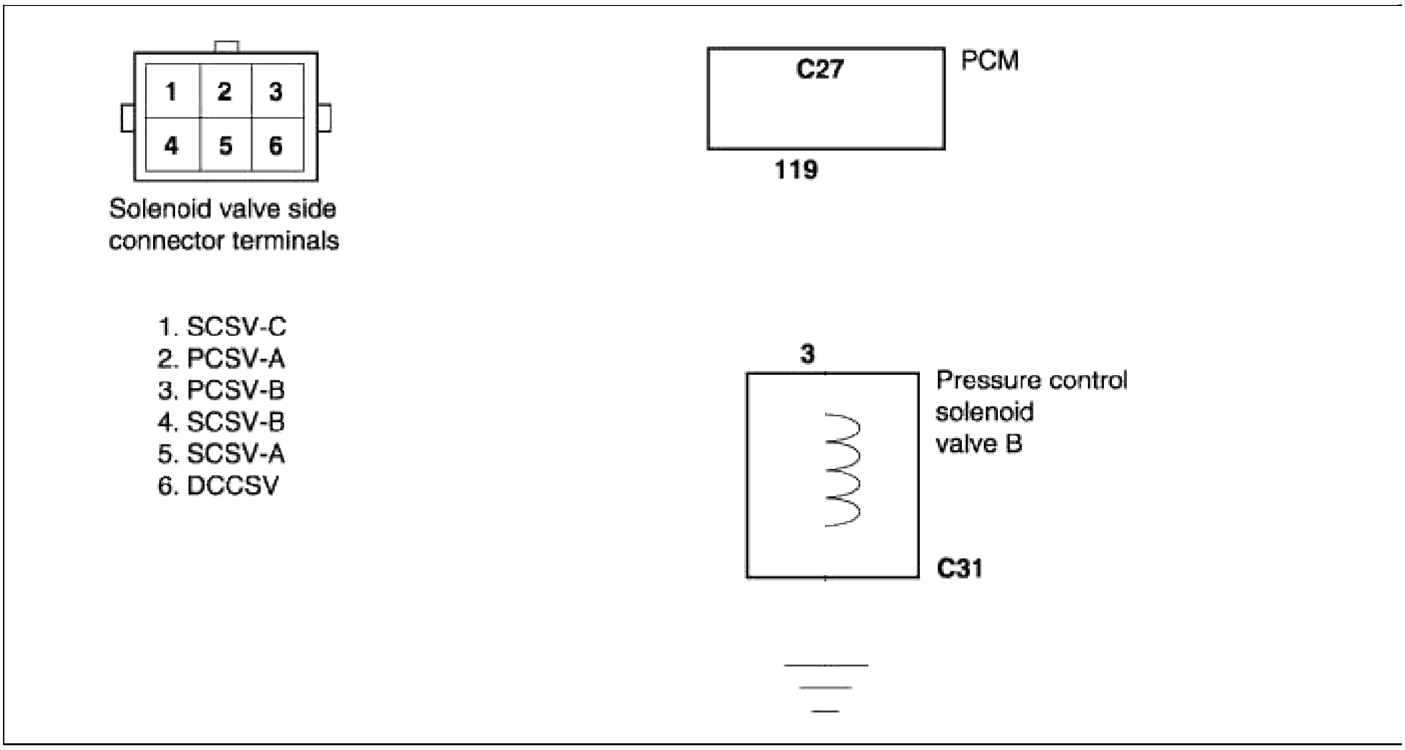
DESCRIPTION

- Controls fluid pressure that is acting on the pressure control valve-B (PCV-B) through Pulse Width Modulation signals from the PCM to control pressure during a shift.

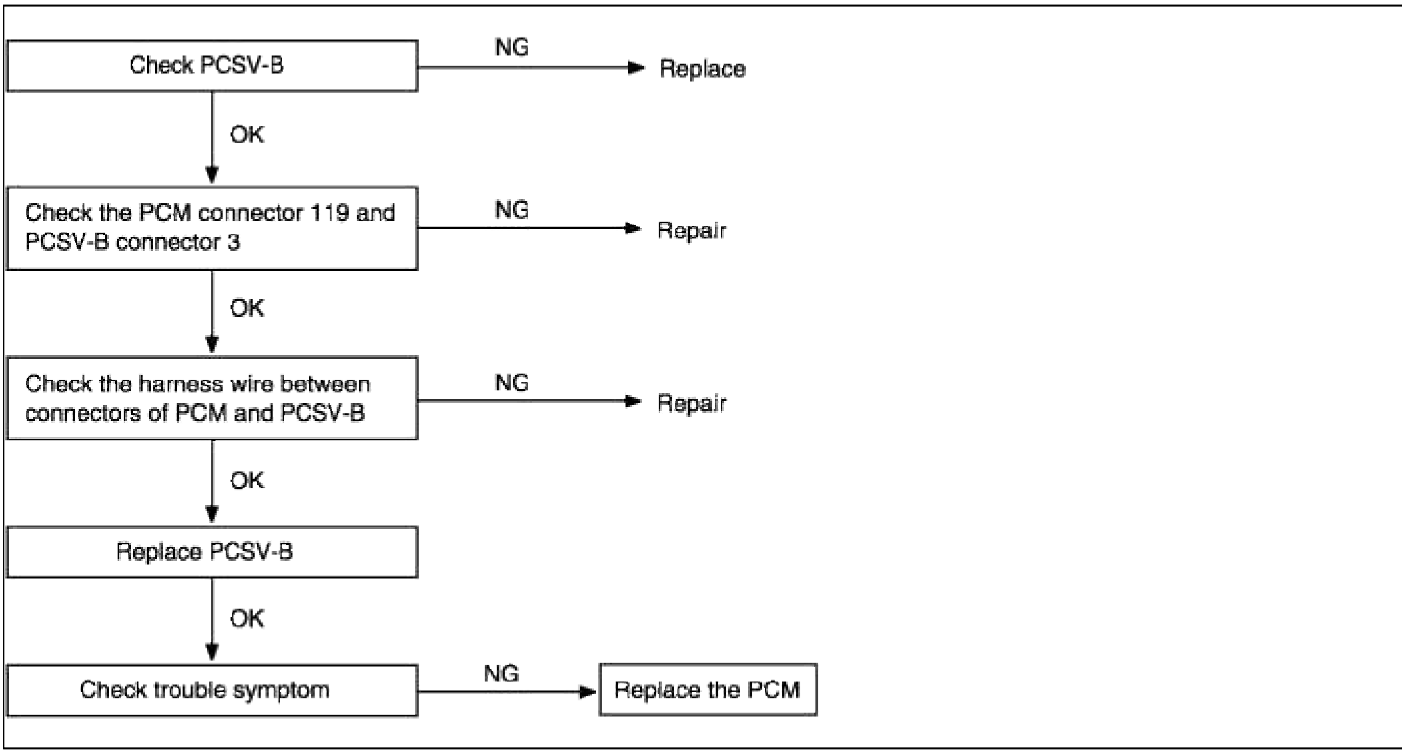
TROUBLESHOOTING FLOW

Detection condition	Possible cause	Check item
• IG S/W "ON" or start release • PCM senses an open • Short in the PCSV-B circuit	• Malfunction of PCSV-B • Malfunction of connector • Malfunction of PCM	• Open/short in PCSV-B circuit • Malfunction of PCSV-B
SYMPTOM • Shock felt as transaxle is engaged • Shift shock is felt as transaxle shifts through gears • Abrupt increase of engine rpm • When code P0775 is generated for the 4th time, automatic transaxle will hold 3rd gear (D) or 2nd gear (2,L)		

CIRCUIT DIAGRAM


1
2
3
4
5
6
Solenoid valve side connector terminals
1. SCSV-C
2. PCSV-A
3. PCSV-B
4. SCSV-B
5. SCSV-A
6. DCCSV
C27
PCM
119
3
Pressure control solenoid valve B
C31

TROUBLESHOOTING FLOW


Check PCSV-B
NG
Replace
OK
Check the PCM connector 119 and PCSV-B connector 3
NG
Repair
OK
Check the harness wire between connectors of PCM and PCSV-B
NG
Repair
OK
Replace PCSV-B
OK
Check trouble symptom
NG
Replace the PCM

Automatic Transaxle System > Troubleshooting > P1709

DIAGNOSTIC ITEM

P1709

DTC NO	DIAGNOSTIC ITEM	
P1709	KICK DOWN SERVO SWITCH	- Open, short circuit -

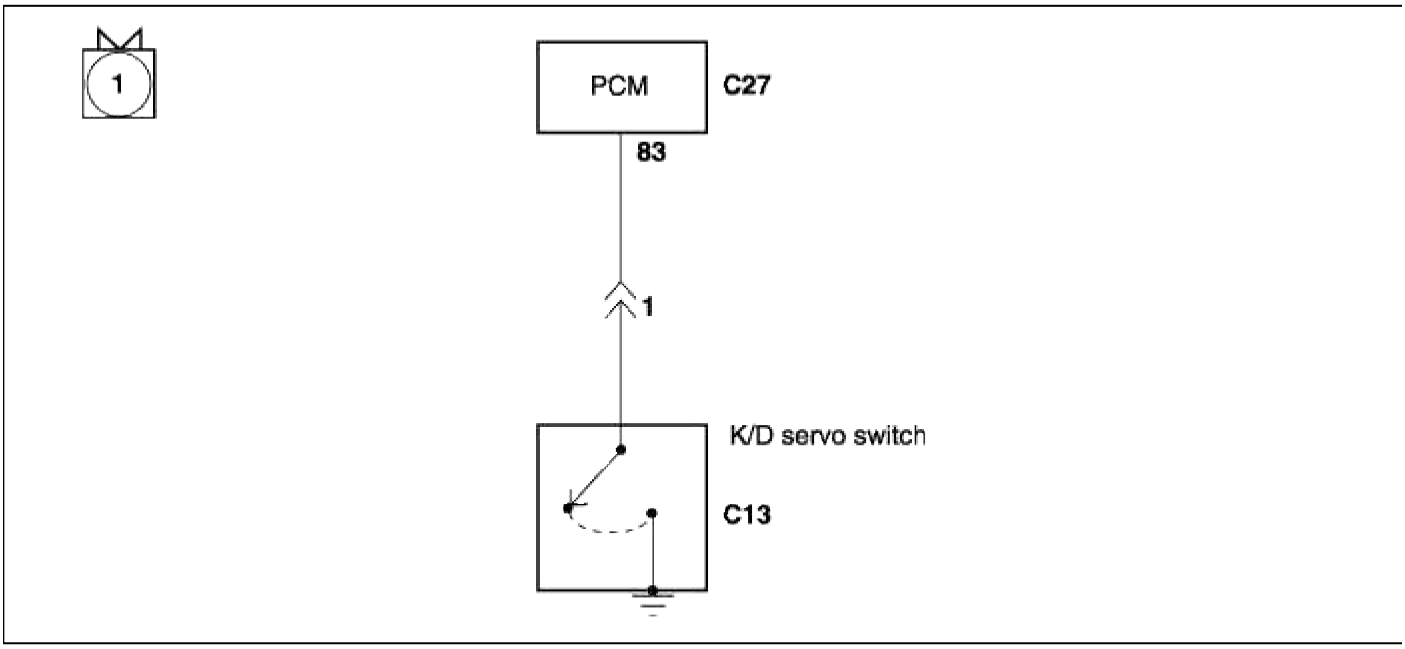
DESCRIPTION

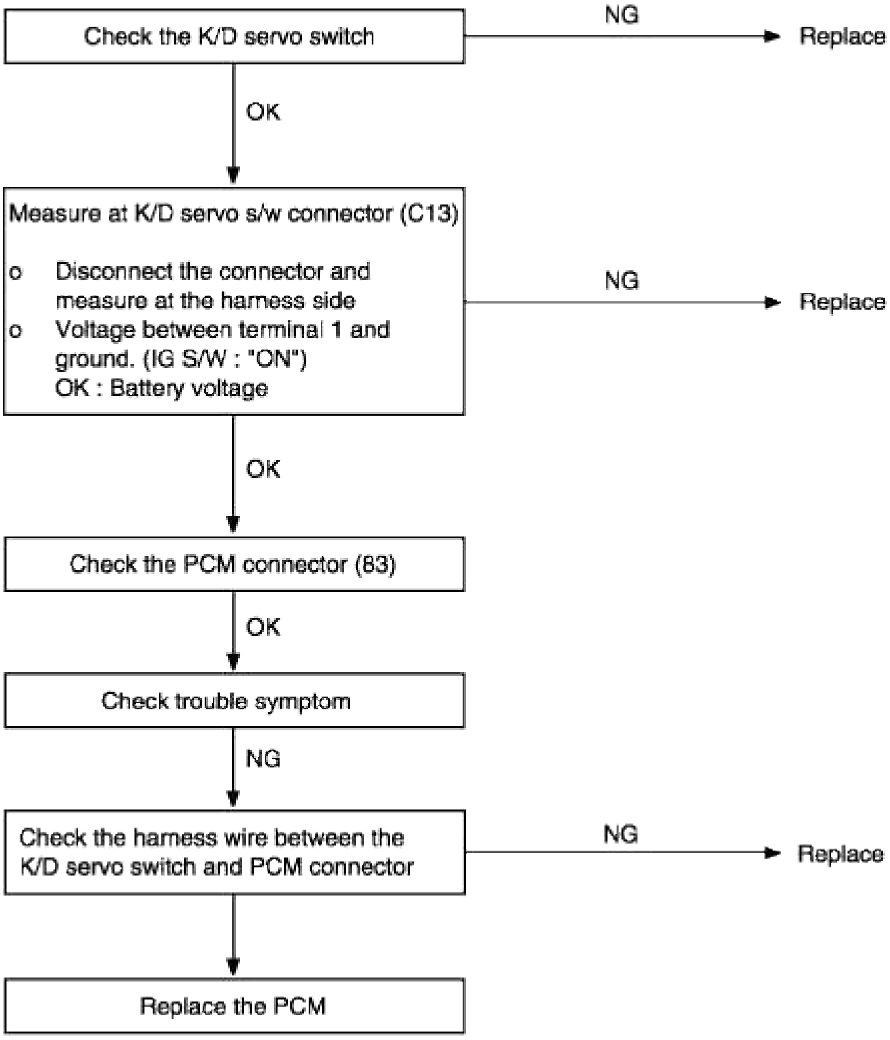
- Detects the point of time when K/D band starts operation to control fluid pressure when K/D band operates.

TROUBLESHOOTING GUIDE

Detection condition	Possible cause	Check item
• 1st or 3rd gear signal is present for more than 5 sec. • Transfer shaft speed is greater than 900 rpm • Fluid temperature is above 60°C • PCM receives an "OFF" signal from K/D servo s/w	• Malfunction of K/D servo s/w • Malfunction of connector • Malfunction of PCM	• Harness & connnector • K/D servo s/w • K/D servo assembly
SYMPTOM • Shift shock is experienced as transaxle shifts into 2nd and 4th gears.		

CIRCUIT DIAGRAM

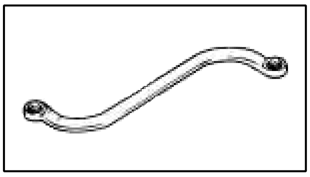
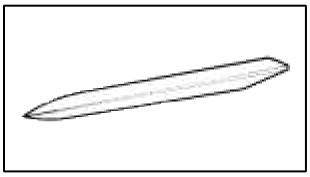
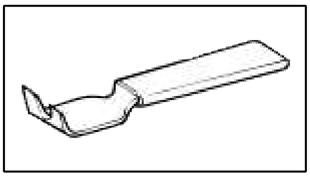
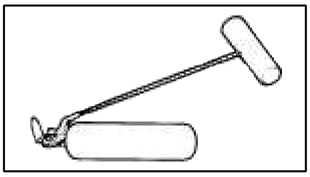
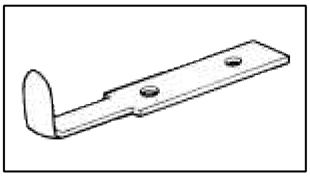
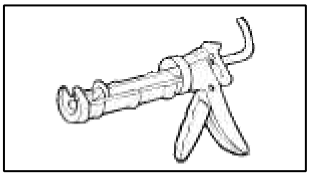
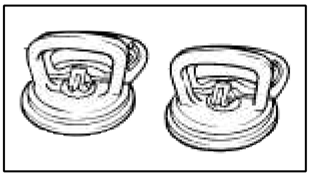
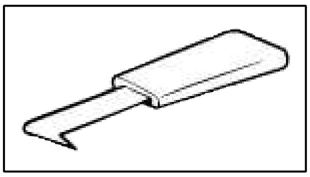
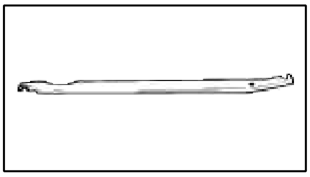



Check the K/D servo switch
NG
Replace
OK
Measure at K/D servo s/w connector (C13)
o Disconnect the connector and measure at the harness side
o Voltage between terminal 1 and ground. (IG S/W : "ON")
OK : Battery voltage
NG
Replace
OK
Check the PCM connector (83)
OK
Check trouble symptom
NG
Check the harness wire between the K/D servo switch and PCM connector
NG
Replace
Replace the PCM

ACCENT(LC) > 2002 > G 1.5 SOHC > Body (Interior and Exterior)

Body (Interior and Exterior) > General Information > Special Service Tools

SPECIAL TOOLS

Tool (Number and name)	Illustration	Use
09793-21000 Door hinge adjusting wrench		Adjustment, removal, and installation of the door hinge
09800-21000 Ornament remover		Trim removal
09853-31000 Headliner clip remover		Removal of the headliner clip
09861-31100 Sealant cut-out tool		Cutting the sealant of the windshield (use with 09861-31200)
09861-31200 Sealant cutting blade		Cutting the sealant of the windshield (use with 09861-31100)
09861-31300 Sealant gun		Application of the sealant to the windshield
09861-31400 Glass holder		Removal and installation of the windshield
09861-31000 Windshield moulding remove		Removal of the windshield moulding
09681-22000 Torsion bar wrench		Removal and installation of the torsion bar in the luggage compartment

Body (Interior and Exterior) > General Information > Troubleshooting

TROUBLESHOOTING

Trouble symptom	Probable cause	Remedy
Water leaks from sunroof	Dirt accumulated in drain tube	Clear dirt inside of drain
	Clogged drain tube	Blow air into drain to remove dirt
	Broken or dislocated drain tube, defective or cracked clip	Check tube installation and flange contact
	Deteriorated roof lid weatherstrip	Replace
	Excessive roof lid-to-body clearance and improperly fitted weatherstrip	Adjust
Wind noise around sunroof	Loose or deformed deflector, gaps in body work	Retighten adjust or replace
Wind noise around door	Weatherstrip not holding firmly	Adjust fit of door
	Improperly installed weatherstrip or setting of weatherstrip	Repair or replace
	Improperly closed door	Adjust
	Improperly fitting door	Adjust
	Improper clearance between door glass and division channel	Adjust
	Deformed door	Repair or replace
Door glass fails to operate up and down	Incorrect window glass installation	Adjust position
	Damaged or faulty regulator arm or regulator	Correct or replace
Door does not open or close completely	Incorrect door installation	Adjust position
	Defective door check assembly	Correct or replace
	Door hinge requires grease	Apply grease
Hood does not open or close completely	Striker and latch not properly aligned	Adjust
	Incorrectly installed hood	Adjust
	Incorrect hood bumper height	Adjust
Water leak through windshield and rear window	Defective seal	Fill with sealant
	Defective flange	Correct
Wind noise around door	Weatherstrip not holding firmly	Adjust fit of door
	Improperly installed weatherstrip	Repair or replace
	Improperly closed door	Adjust
	Improperly fit door	Adjust
	Improper clearance between door glass and division channel	Adjust

	Deformed door	Repair or replace

Body (Interior and Exterior) > General Information > Specifications

SPECIFICATIONS

Items	Specifications
Hood Type	Rear hinged, front opening type (open stay rod type)
Front door Construction Regulator system Locking system	Front hinged, full door construction Wire drum type Pin-fork system
Rear door Construction Regulator system Locking system	Front hinged, full door construction Wire drum type Pin-fork system
Trunk lid Type	Torsion bar type
Tailgate Type	Inner hinged, gas lifter type
Glass thickness mm (in.) Windshield glass Front door glass Rear door glass Fixed glass Tailgate glass	5.0 (0.20) 3.2 (0.13) 3.2 (0.13) 3.5 (0.14) 3.5 (0.14)
Seat belts	3 point type with E.L.R.

E.L.R. : Emergency Locking Retractor

TIGHTENING TORQUE

	Nm	kg·cm	lb·ft
Door			
Door hinge to body	35 ~ 42	350 ~ 420	25 ~ 31
Door hinge to door	22 ~ 27	220 ~ 270	16 ~ 19.5
Door striker mounting bolt	17 ~ 22	170 ~ 220	12 ~ 16
Trunk lid			
Trunk lid hinge to body	7 ~ 9	70 ~ 90	5 ~ 7
Trunk lid hinge to trunk lid	7 ~ 9	70 ~ 90	5 ~ 7
Tailgate			
Tailgate hinge to body	7 ~ 9	70 ~ 90	5 ~ 7
Tailgate hinge to tailgate	7 ~ 9	70 ~ 90	5 ~ 7
Tailgate latch mounting bolt	7 ~ 11	70 ~ 110	5 ~ 8
Tailgate striker mounting bolt	9 ~ 14	90 ~ 140	7 ~ 10
Hood			
Hood hinge to body	22 ~ 27	220 ~ 270	16 ~ 19.5
Hood hinge to hood	22 ~ 27	220 ~ 270	16 ~ 19.5
Hood latch to body	7 ~ 11	70 ~ 110	5 ~ 8
Seat			
Front seat to floor bolt	35 ~ 55	350 ~ 550	25 ~ 40
Rear seat back center bracket bolt	17 ~ 26	170 ~ 260	12 ~ 19
Rear seat back lower side bracket bolt	17 ~ 26	170 ~ 260	12 ~ 19
Rear seat cushion mounting bolt	17 ~ 26	170 ~ 260	12 ~ 19
Seat belt			
Front seat belt retractor mounting bolt	40 ~ 55	400 ~ 550	30 ~ 40
Front seat belt upper anchor mounting bolt	40 ~ 55	400 ~ 550	30 ~ 40
Front seat belt sliding bar mounting bolt	40 ~ 55	400 ~ 550	30 ~ 40
Front seat belt height adjuster mounting bolt	40 ~ 55	400 ~ 550	30 ~ 40
Rear seat belt retractor mounting bolt	40 ~ 55	400 ~ 550	30 ~ 40
Rear seat belt upper anchor mounting bolt	40 ~ 55	400 ~ 550	30 ~ 40
Front seat belt buckle mounting bolt	40 ~ 55	400 ~ 550	30 ~ 40
Sunroof			
Sunroof lid panel mounting nut	7 ~ 9	70 ~ 90	5 ~ 7
Sunroof assembly mounting bolt	7 ~ 11	70 ~ 110	5 ~ 8

Body (Interior and Exterior) > Exterior > hood > Repair procedures

REMOVAL AND INSTALLATION

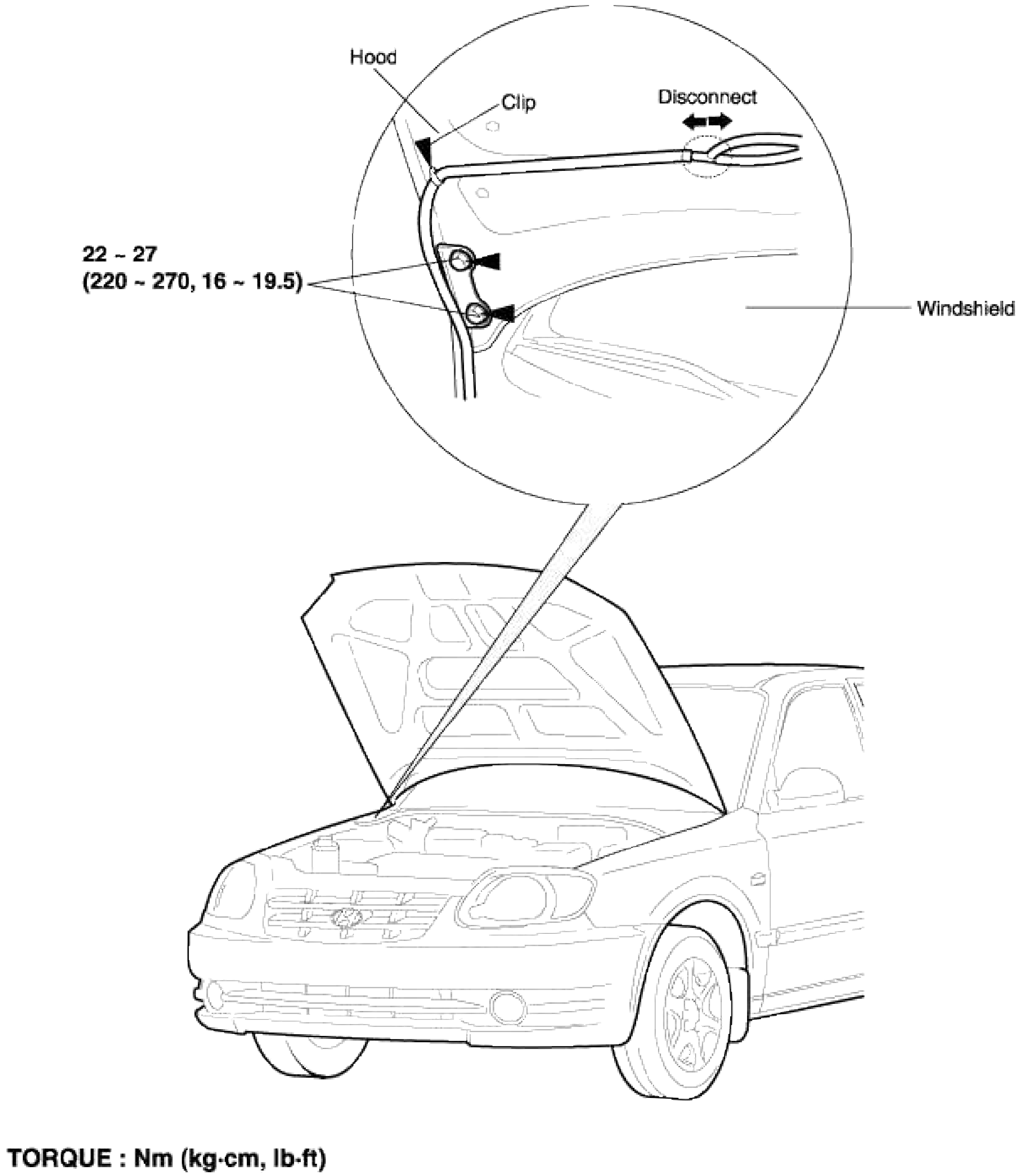
HOOD

1. Disconnect the windshield washer nozzle connecting tube and clip.
2. After loosening the hood hinge mounting bolts(4EA), remove the hood.

3. Installation is the reverse of removal.

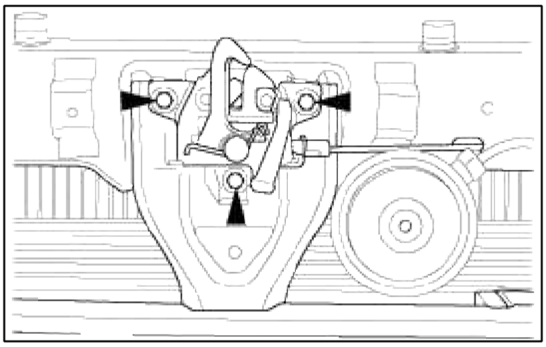
CAUTION

When removing and installing the hood, an assistant is necessary.


Hood
Clip
Disconnect
22 ~ 27
(220 ~ 270, 16 ~ 19.5)
Windshield
TORQUE : Nm (kg-cm, lb-ft)

HOOD LATCH

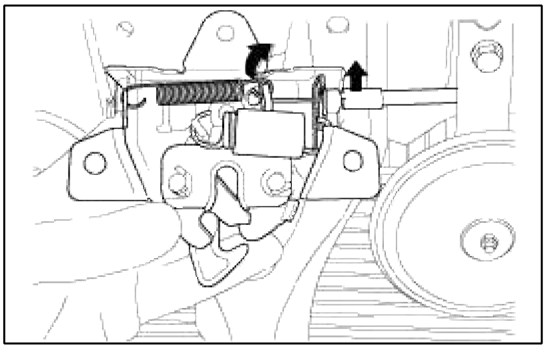
1. Remove the hood latch mounting bolts(3EA).



TORQUE : 7 ~ 11 Nm (70 ~ 110 kg·cm, 5 ~ 8 lb·ft)

---

2. After disconnecting the hood latch and the hood latch cable, remove the hood latch.

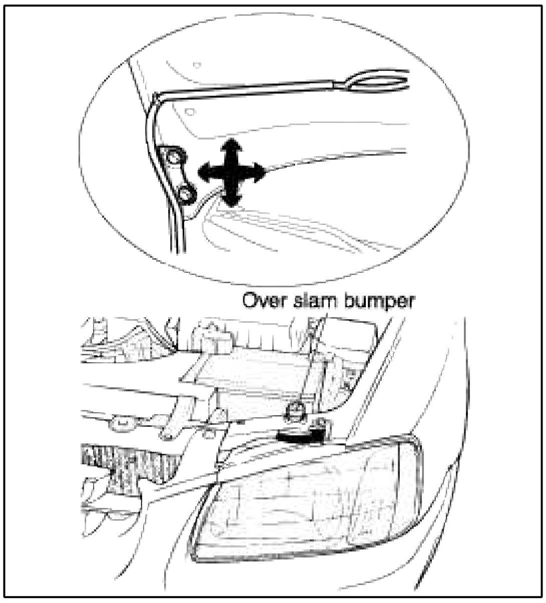


3. Installation is the reverse of removal.

ADJUSTMENT

HOOD

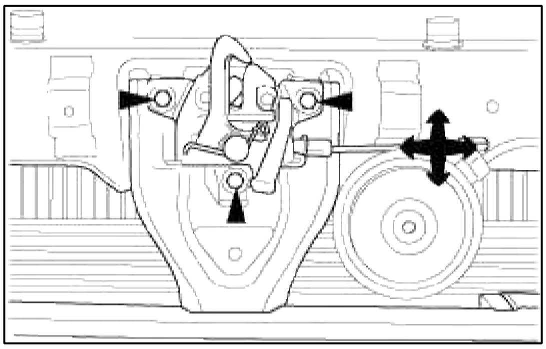
1. After loosening the hood hinge mounting bolt, adjust the hood by moving it up or down, or right or left.
2. Adjust the hood height by turning the hood over slam bumper.



HOOD LATCH

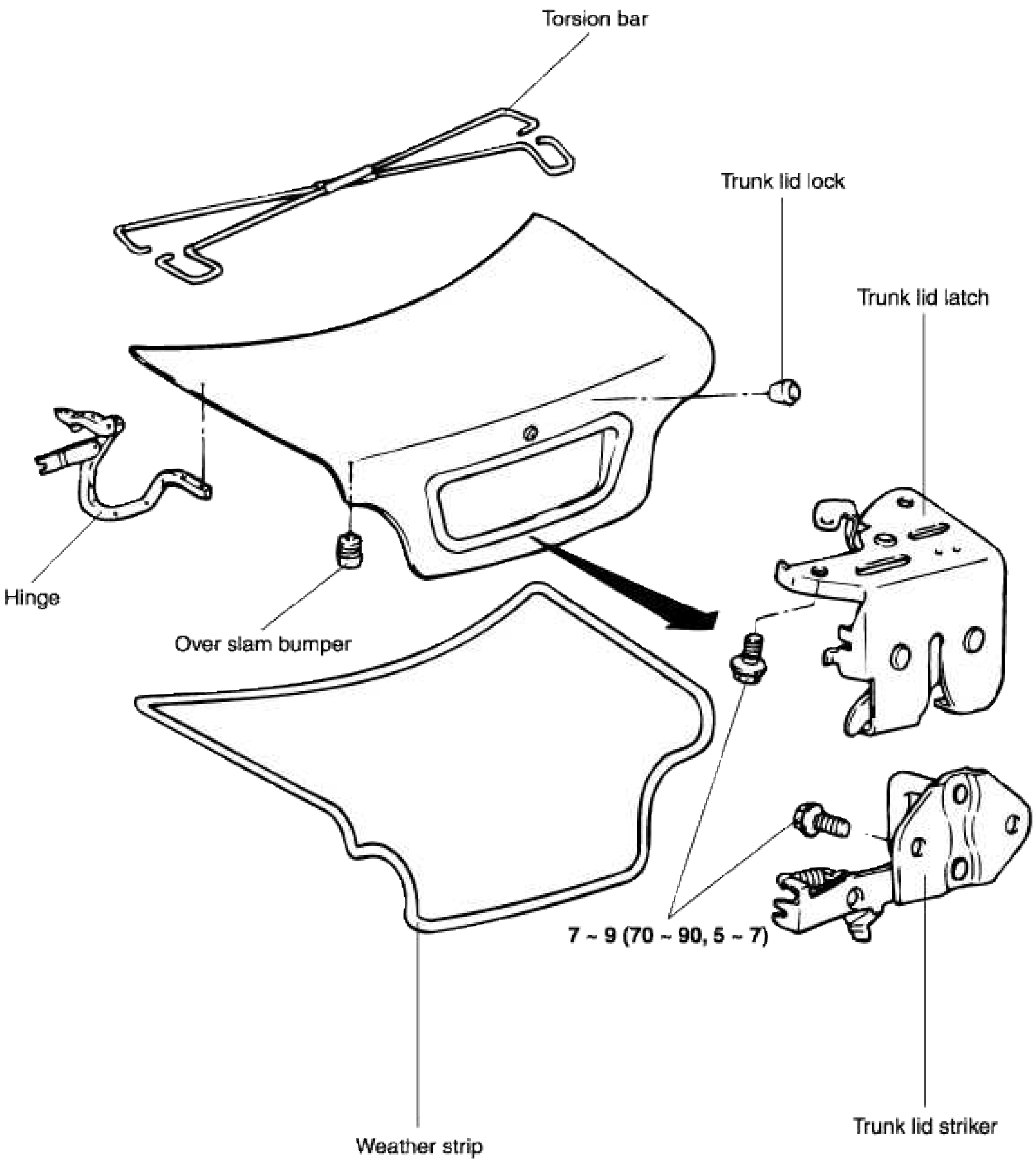
1. Loosen the hood latch mounting bolt lightly.

2. Adjust the hood latch by moving it up or down, or right or left.



Body (Interior and Exterior) > Exterior > trunk lid > Components and Components Location

COMPONENTS

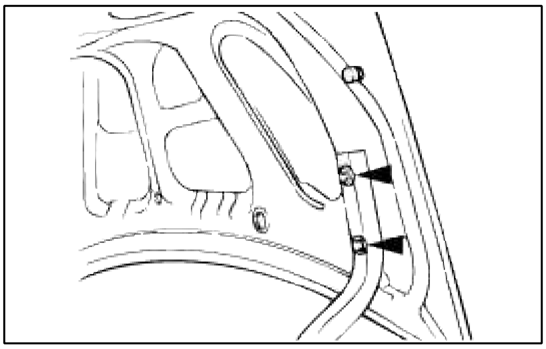

Torsion bar
Trunk lid lock
Trunk lid latch
Hinge
Over slam bumper
7 ~ 9 (70 ~ 90, 5 ~ 7)
Weather strip
Trunk lid striker

TORQUE : Nm (kg·cm, lb·ft)

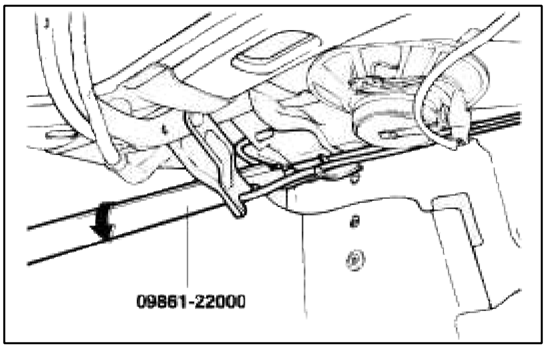
Body (Interior and Exterior) > Exterior > trunk lid > Repair procedures

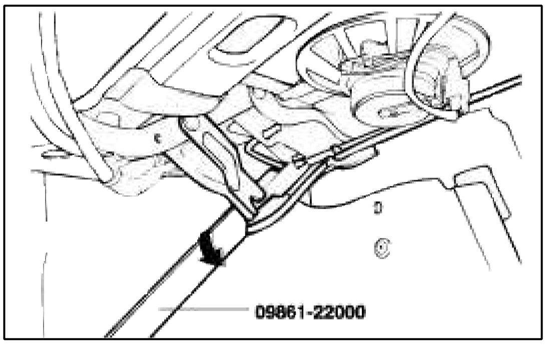
REMOVAL AND INSTALLATION

1. Remove the trunk lid hinge mounting bolts and remove trunk lid.

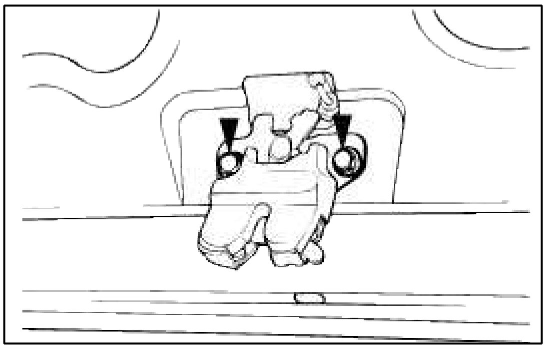


2. Remove the torsion bar by using the torsion bar wrench (09861-22000) as shown in the illustration.





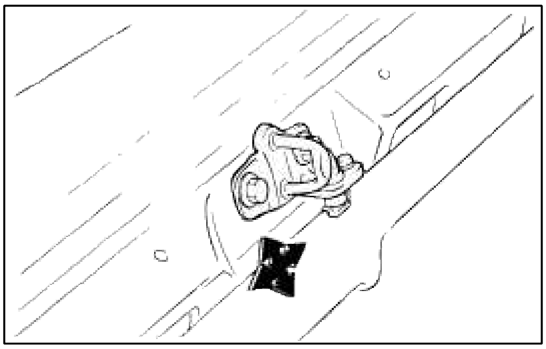
3. Remove the trunk lid latch and trunk lid lock.



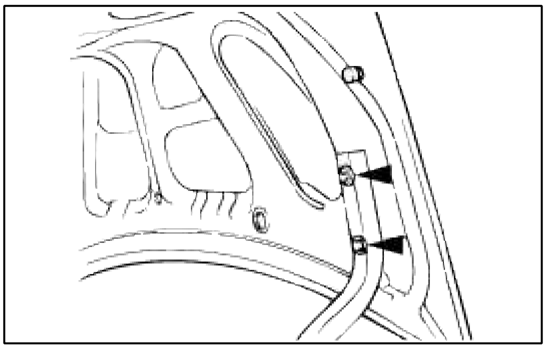
4. Installation is the reverse of removal.

ADJUSTMENT

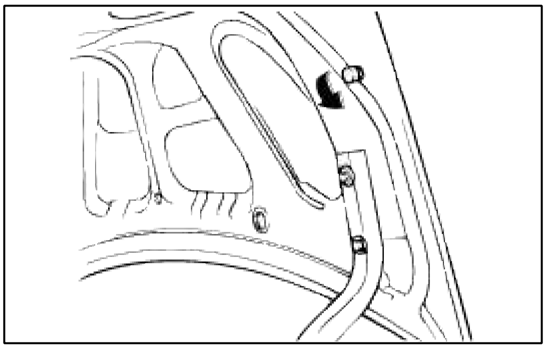
1. Adjust the striker up, down, right or left until the trunk lid is flush with the rear edge of the body.



2. Adjust the trunk hinges up, down, right or left until the gap is flush between the lid and body.

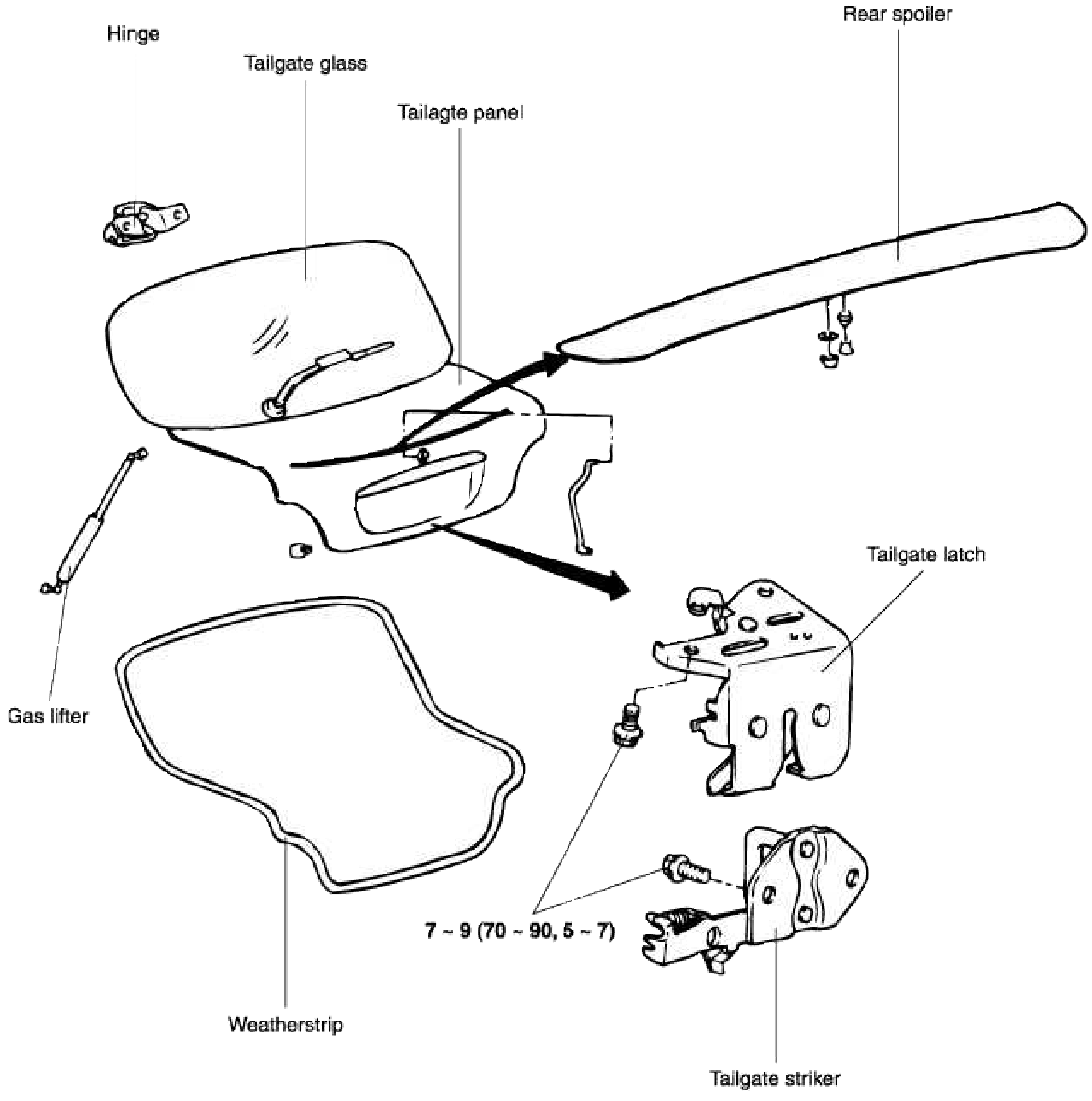


3. Turn the lid bumpers either clockwise or counterclockwise to adjust the height of the trunk lid.



Body (Interior and Exterior) > Exterior > tail gate > Components and Components Location

COMPONENTS


Hinge
Tailgate glass
Tailagte panel
Rear spoiler
Tailgate latch
Gas lifter
7 ~ 9 (70 ~ 90, 5 ~ 7)
Weatherstrip
Tailgate striker

TORQUE : Nm (kg·cm, lb·ft)

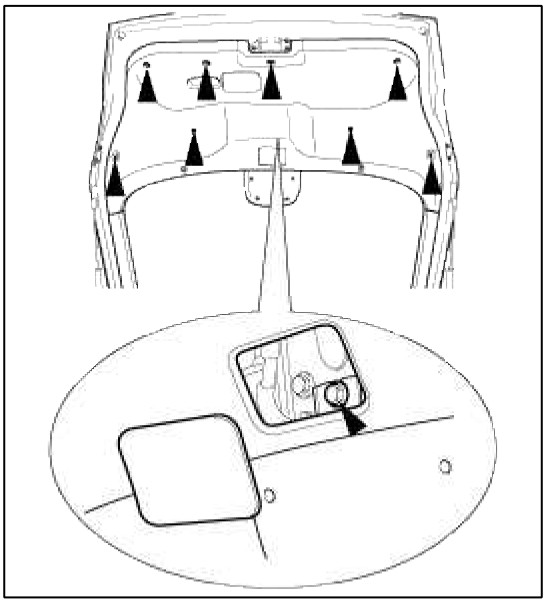
Body (Interior and Exterior) > Exterior > tail gate > Repair procedures

REMOVAL AND INSTALLATION

TAILGATE TRIM

1. Remove the tailgate trim mounting screws(8EA).

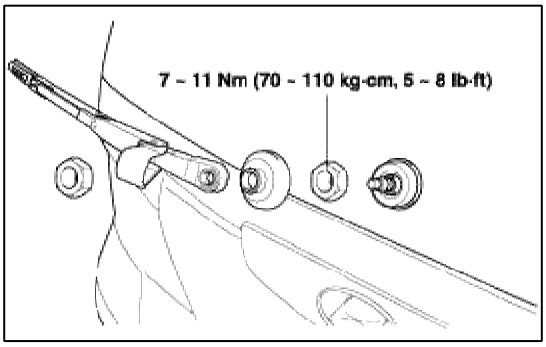
2. Remove the tailgate trim mounting bolt.



3. Installation is the reverse of removal.

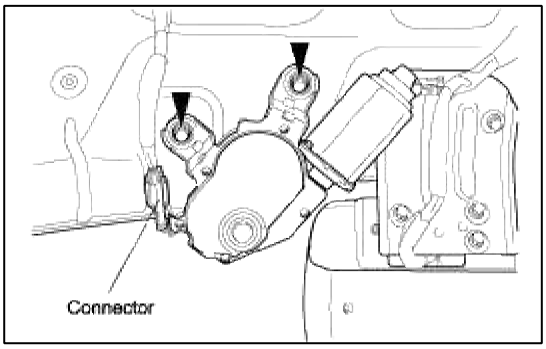
REAR WIPER ASSEMBLY

1. Remove the tailgate trim.
2. Remove the rear wiper.



3. After loosening the rear wiper motor mounting bolts(2EA), remove the rear wiper motor.

TORQUE : 4 ~ 7 Nm (40 ~ 70 kg·cm, 3 ~ 5 lb·ft)

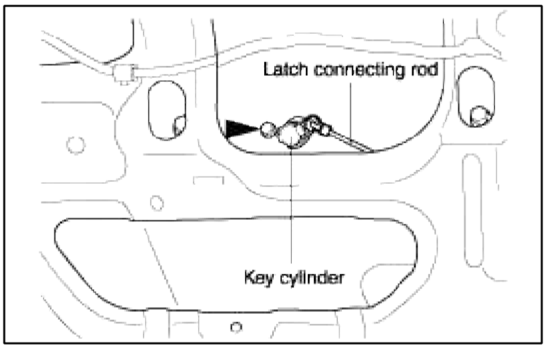


4. Installation is the reverse of removal.

KEY CYLINDER

1. Remove the tailgate trim. ("See Page BD-13")

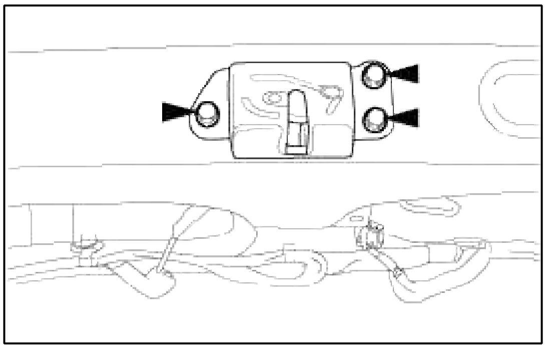
2. Disconnect the latch connecting rod, loosen the mounting bolt and then remove the key cylinder.


Latch connecting rod
Key cylinder

3. Installation is the reverse of removal.

LATCH

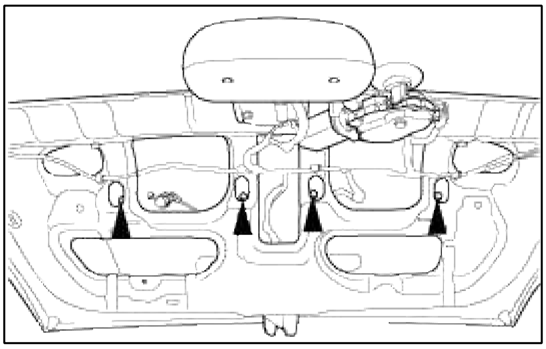
1. Remove the tailgate trim. ("See Page BD-13")
2. Disconnect the key cylinder and latch connecting rod.
3. After loosening the latch mounting bolt(3EA), remove the latch.

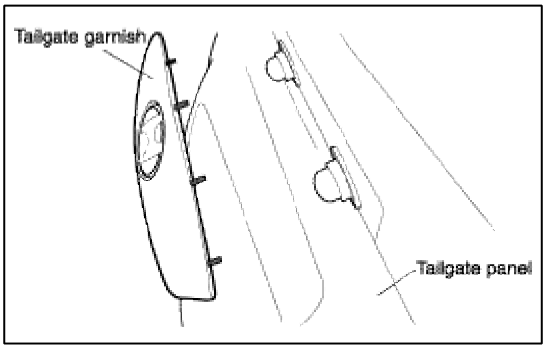


4. Installation is the reverse of removal.

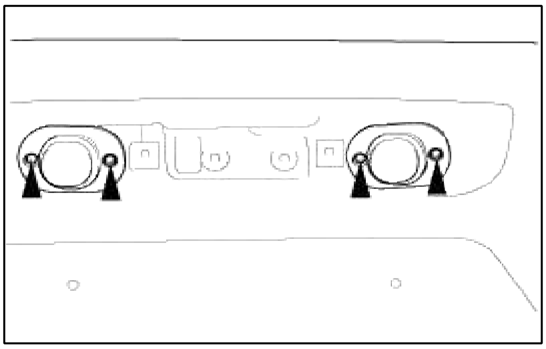
TAILGATE GARNISH

1. Remove the tailgate trim. ("See Page BD-13")
2. Loosen the tailgate garnish mounting nut (4EA), and remove the tailgate garnish.




Tailgate garnish
Tailgate panel

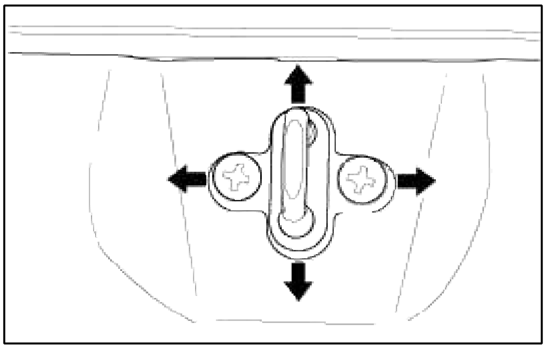
3. Loosen the license plate lamp mounting screws (4EA),and remove the license plate lamp.



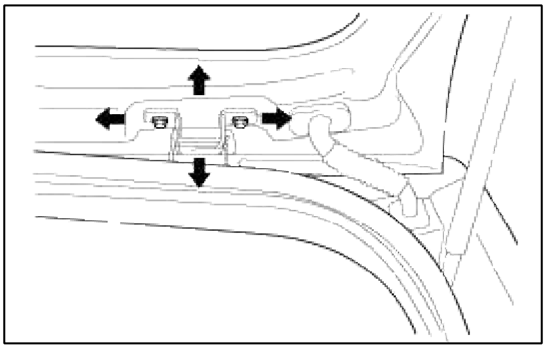
4. Installation is the reverse of removal.

ADJUSTMENT

1. Align the tailgate and body by moving the striker up, down, left or right.

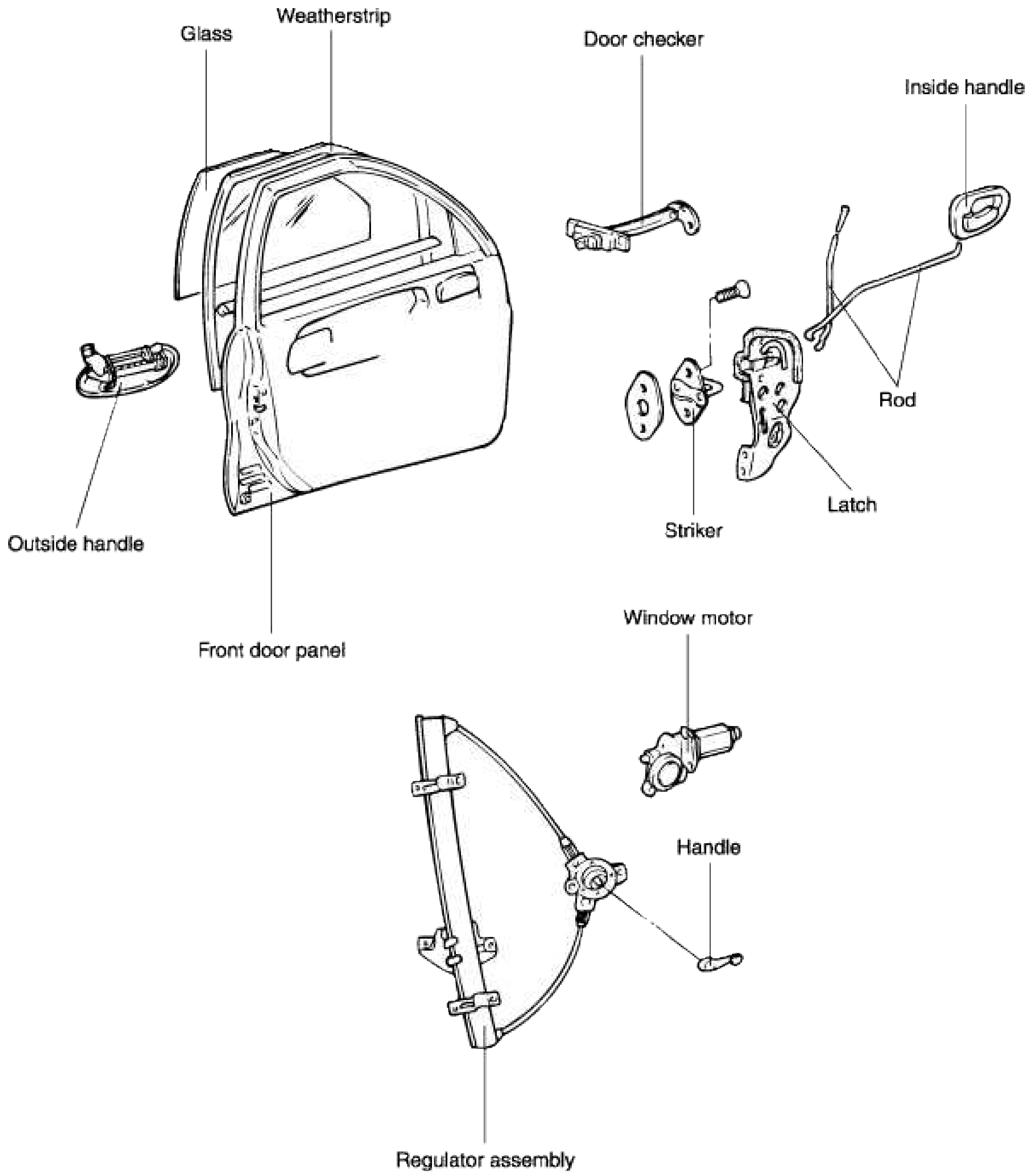


2. Align the cap between the tailgate and the body by moving the tailgate hinge.



Body (Interior and Exterior) > Exterior > front door > Components and Components Location

COMPONENTS


Weatherstrip
Glass
Door checker
Inside handle
Rod
Outside handle
Latch
Striker
Window motor
Front door panel
Handle
Regulator assembly

Body (Interior and Exterior) > Exterior > front door > Repair procedures

REMOVAL AND INSTALLATION

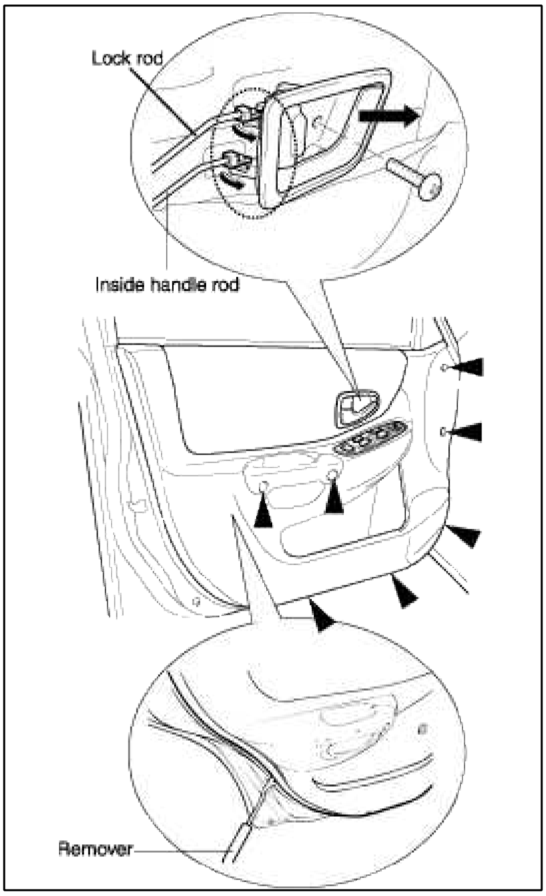
FRONT DOOR TRIM

1. Remove the inside handle mounting screw.

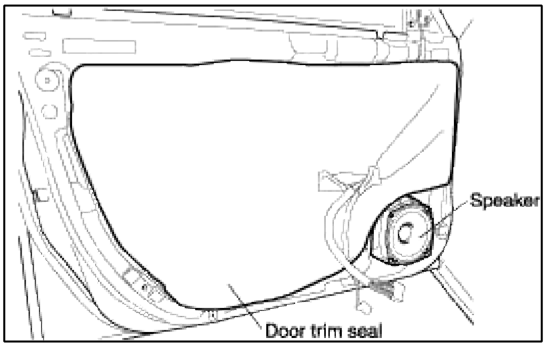
2. Loosen the door trim mounting screws(7EA), remove the trim using a trim remover, and then disconnect the power window switch connector.

NOTE

When using a trim remover, wrap it with a piece of cloth so it will not damage the painted surface.


Lock rod
Inside handle rod
Remover

3. Remove the door trim seal, speaker, and connector.


Speaker
Door trim seal

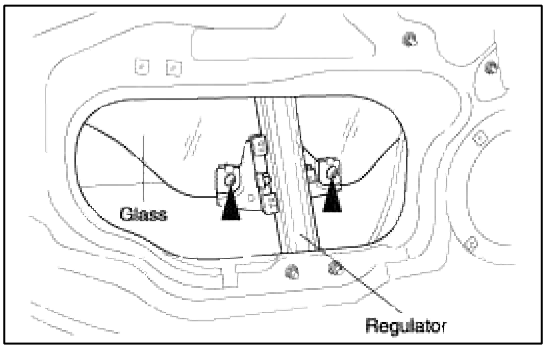
4. Installation is the reverse of removal.

GLASS AND REGULATOR

1. Remove the door trim, door trim seal, speaker.("See Page BD-17")

2. Carefully move the glass by the power window switch until the 2 mounting bolts appear, then remove them.

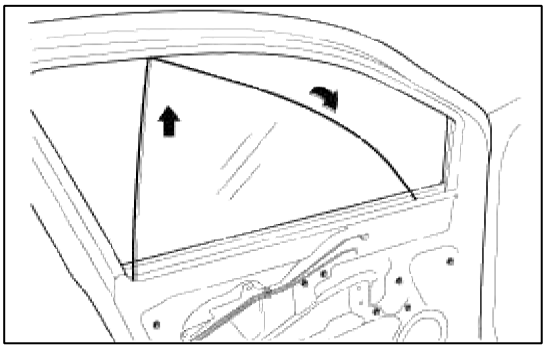
TORQUE : 8 ~ 12 Nm (80 ~ 120 kg·cm, 6 ~ 9 lb·ft)


Glass
Regulator

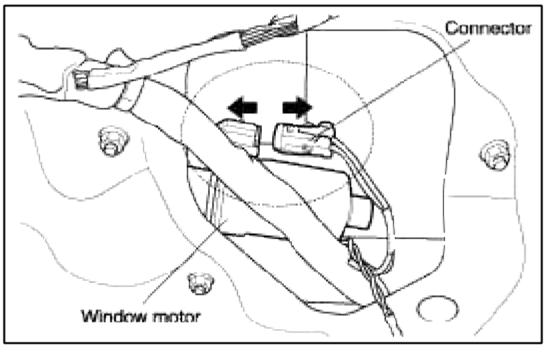
3. Separate the glass from the glass run and carefully pull the glass out through the window slot.

CAUTION

Be careful not to drop the glass and scratch the glass surface.

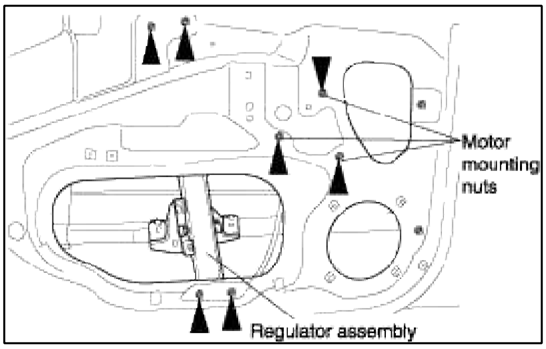


4. Disconnect the power window motor connector.


Connector
Window motor

5. Loosen the regulator mounting nuts(4EA) and power window motor mounting nuts(3EA), then remove the regulator assembly.

TORQUE : 4 ~ 6 Nm (40 ~ 60 kg·cm, 3 ~ 4 lb·ft)


Motor mounting nuts
Regulator assembly

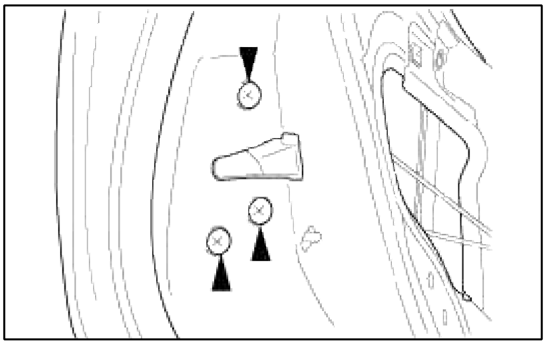
6. After loosening the front channel mounting nuts(2EA), remove the front channel.

7. Installation is the reverse of removal.

LATCH AND OUTSIDE HANDLE

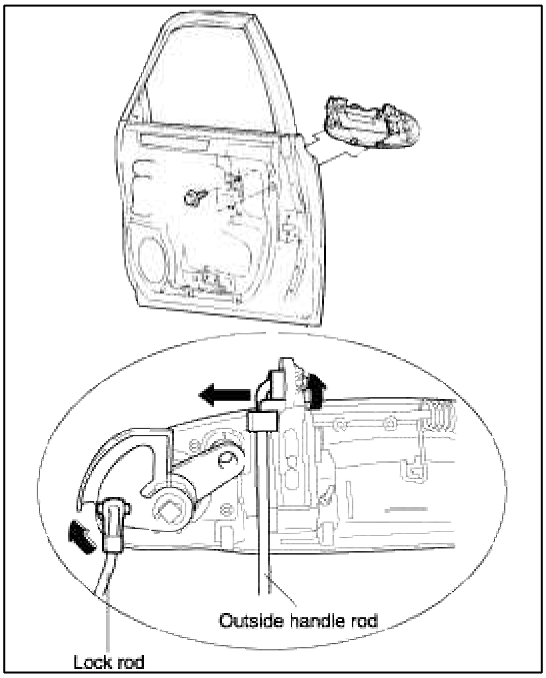
1. Remove the front door trim, door trim seal and speaker.("See Page BD-17")
2. Remove the glass and regulator. ("See Page BD-18")
3. Loosen the latch mounting screws(3EA).

TORQUE : 8 ~ 11 Nm (80 ~ 110 kg·cm,6 ~ 8 lb·ft)



4. Loosen the outside handle mounting bolts(2EA), disconnect the rod, and remove the outside handle.

TORQUE : 8 ~ 11 Nm (80 ~ 110 kg·cm,6 ~ 8 lb·ft)



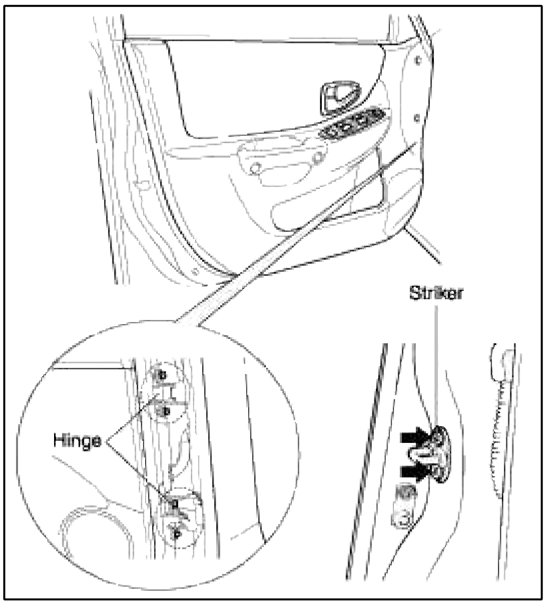
5. Installation is the reverse of removal.

ADJUSTMENT

DOOR

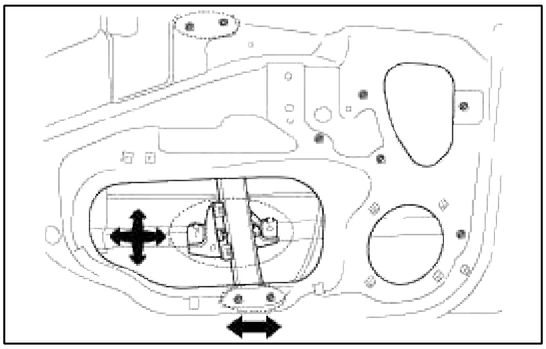
1. After loosening the door hinge mounting bolt lightly, adjust the door by moving it up or down, or right or left.

2. After loosening the door striker mounting screw lightly, adjust the striker by moving it up or down, or right or left.



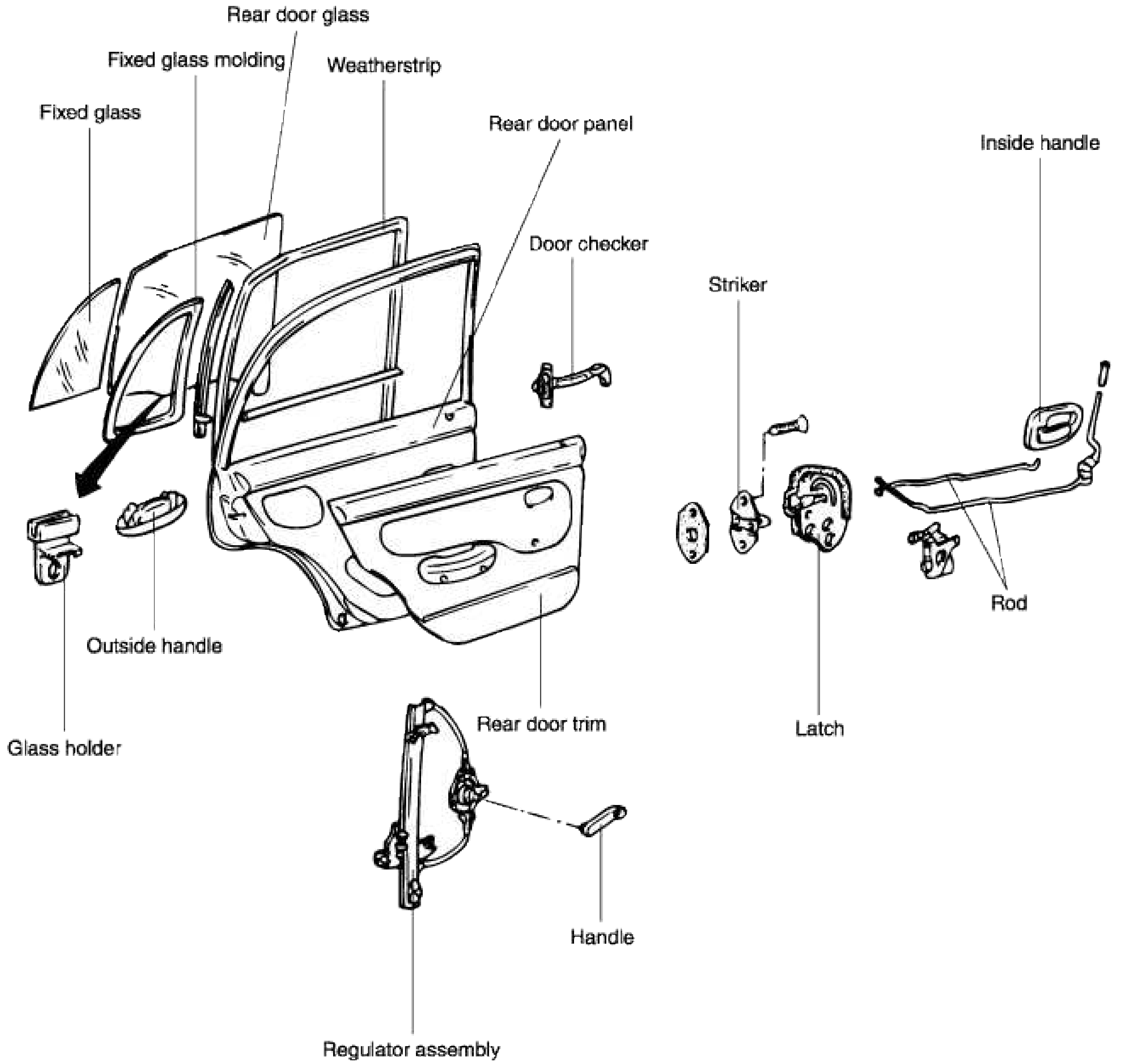
GLASS

1. After loosening the glass mounting bolt, adjust the glass by moving it up or down.
2. After loosening the regulator mounting bolt, adjust the regulator and glass by moving the regulator up, down, right or left.



Body (Interior and Exterior) > Exterior > rear door > Components and Components Location

COMPONENTS


Rear door glass
Fixed glass molding
Weatherstrip
Fixed glass
Rear door panel
Inside handle
Door checker
Striker
Rod
Outside handle
Glass holder
Rear door trim
Latch
Handle
Regulator assembly

Body (Interior and Exterior) > Exterior > rear door > Repair procedures

REMOVAL AND INSTALLATION

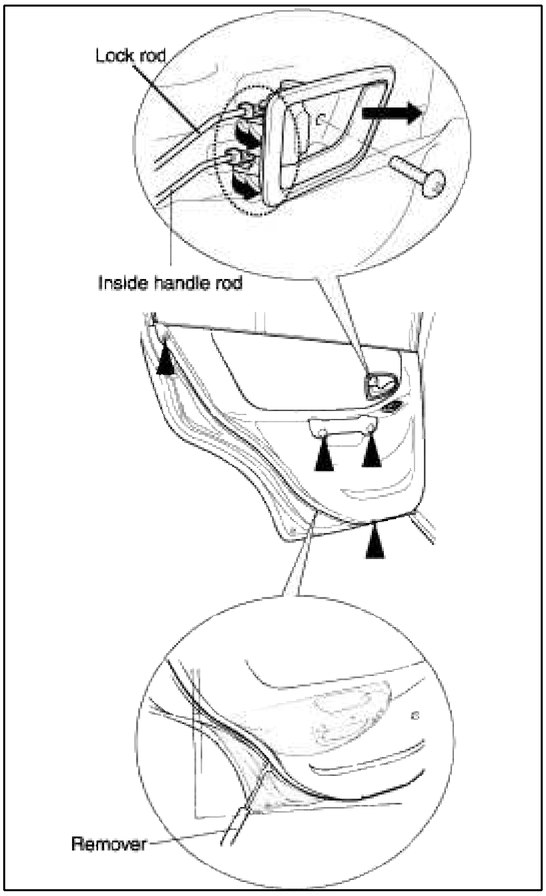
REAR DOOR TRIM

1. Remove the inside handle mounting screw.

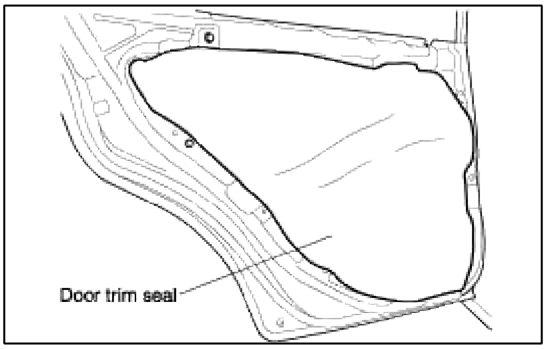
2. Loosen the door trim mounting screws(4EA) and remove the rear door trim using a trim remover.

NOTE

When using a trim remover, wrap it with a piece of cloth so as not to damage the painted surface.


Lock rod
Inside handle rod
Remover

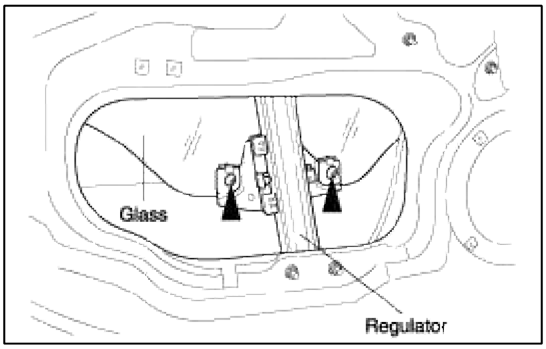
3. Remove the door trim seal.


Door trim seal

4. Installation is the reverse of removal.

GLASS AND REGULATOR

1. Remove the rear door trim, door trim seal.("See Page BD-21")
2. Carefully move the glass by the power window switch until the 2 mounting bolts appear, then remove them.

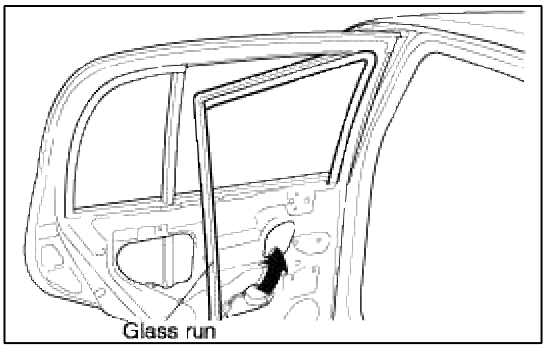

Glass
Regulator

3. Remove 6 regulator assembly mounting nuts, and remove the regulator assembly.

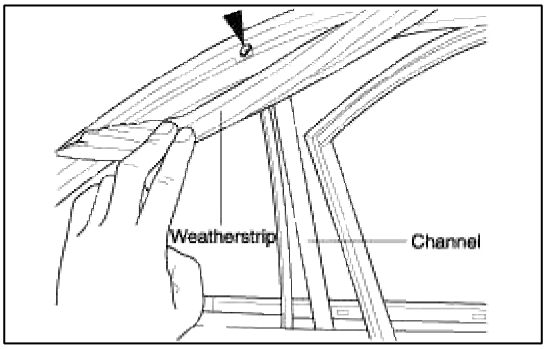
TORQUE : 8 ~ 12 Nm (80 ~ 120 kg·cm,6 ~ 9 lb·ft)

---

4. Remove the glass run from the channel.



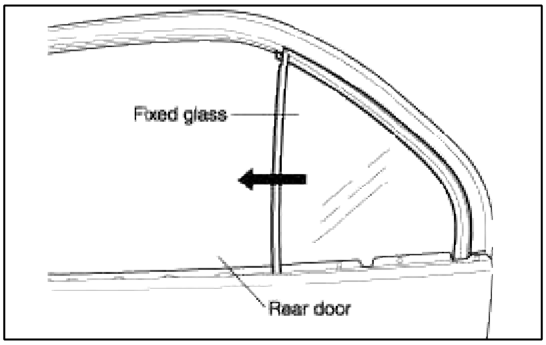
5. After loosening the screw attaching the upper channel, remove the channel.



6. Installation is the reverse of removal.

FIXED GLASS

1. Remove the rear door trim.("See Page BD-21")
2. Remove the glass and regulator.("See Page BD-22")
3. Remove the channel.
   Remove the fixed glass by pulling it as shown in the illustration.

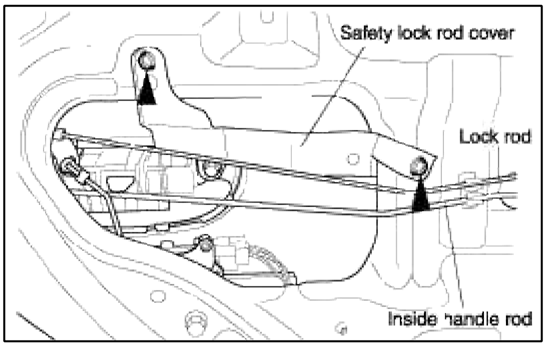


4. Installation is the reverse of removal.

LATCH AND OUTSIDE HANDLE

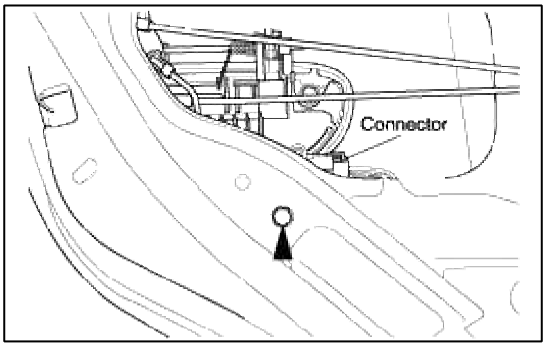
1. Remove the rear door trim, door trim seal.("See Page BD-21)
2. Remove the glass and regulator.("See Page BD-22")

3. After loosening the safety lock rod cover mounting screws(2EA), remove the safety lock rod cover using a remover.

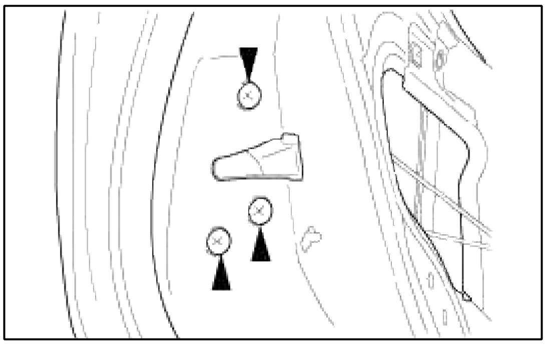

Safety lock rod cover
Lock rod
Inside handle rod

4. Disconnect the actuator connector and loosen the latch mounting screws(3EA).

TORQUE : 8 ~ 11 Nm (80 ~ 110 kg·cm,6 ~ 8 lb·ft)

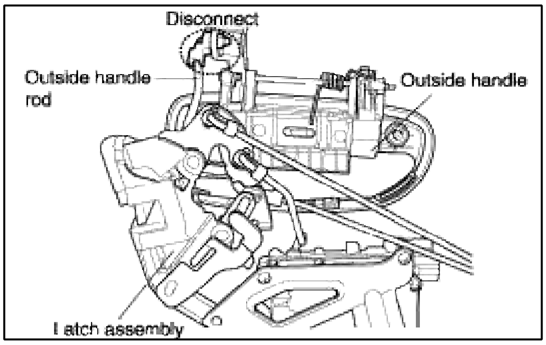


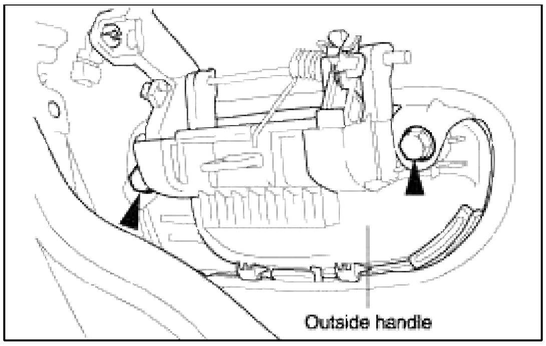
5. Loosen the latch mounting screws.



6. Loosen the outside handle mounting bolts(2EA), disconnect the rod, and then remove the latch and outside handle.

TORQUE : 8 ~ 12 Nm (80 ~ 120 kg·cm,6 ~ 9 lb·ft)


Disconnect
Outside handle rod
Outside handle
Latch assembly

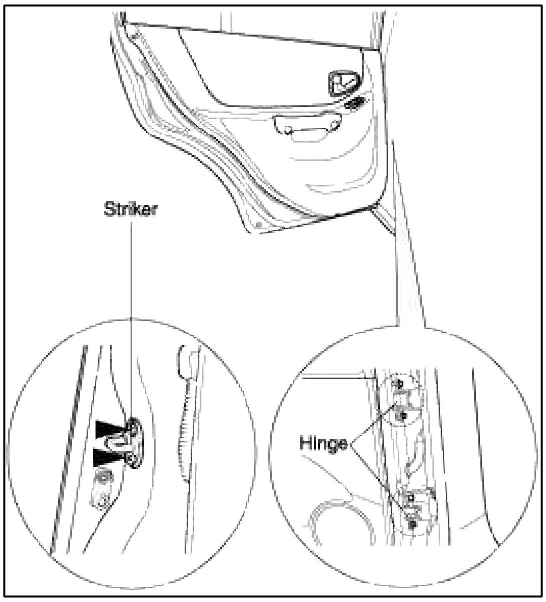


7. Installation is the reverse of removal.

ADJUSTMENT

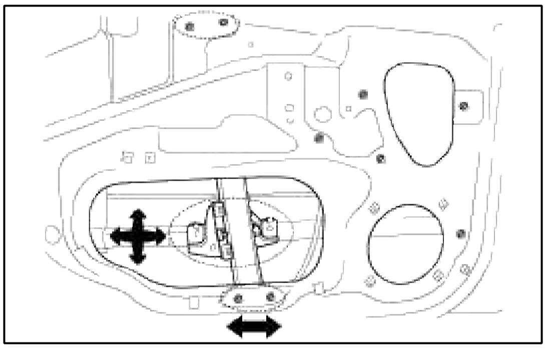
DOOR

1. After loosening the door hinge mounting bolt, lightly adjust the door by moving it up or down, or left or right.
2. After loosening the door striker mounting screw lightly, adjust the striker by moving it up or down, or left or right.



GLASS

1. After loosening the glass mounting bolt, adjust the glass by moving it up or down.
2. After loosening the regulator mounting bolt, adjust the regulator and glass by moving the regulator up, down, right or left.



Body (Interior and Exterior) > Exterior > body side moldings > Repair procedures

REMOVAL AND INSTALLATION

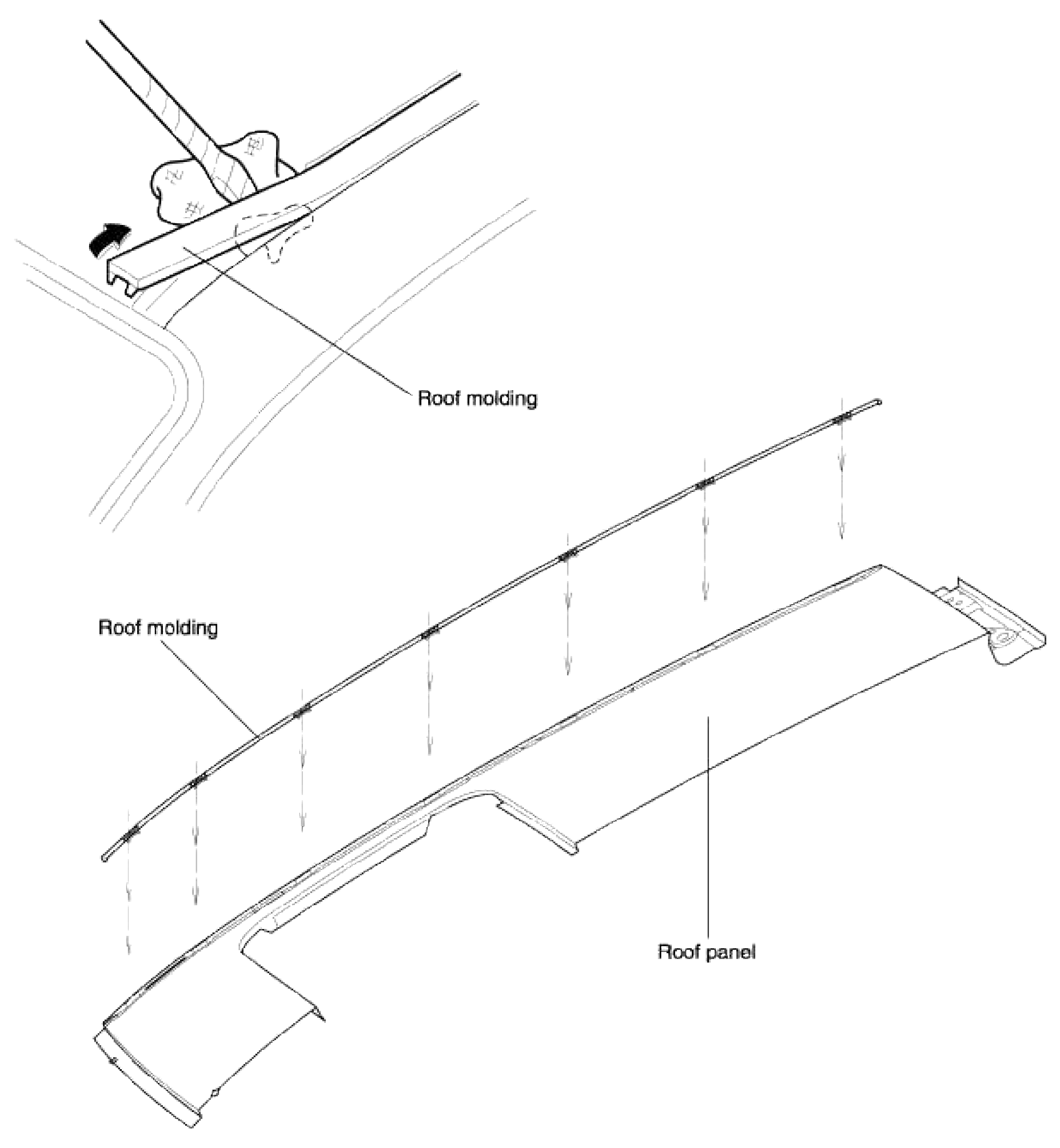
ROOF MOLDING

CAUTION

- Wear gloves to protect hands from injury.
- When using a screwdriver or equivalent, wrap it with protective tape to prevent damage.

NOTE

- Be careful not to scratch the body.
- Remove the windshield molding from the front portion.
- Be careful not to damage the windshield molding.
- Do not reuse the damaged roof molding.



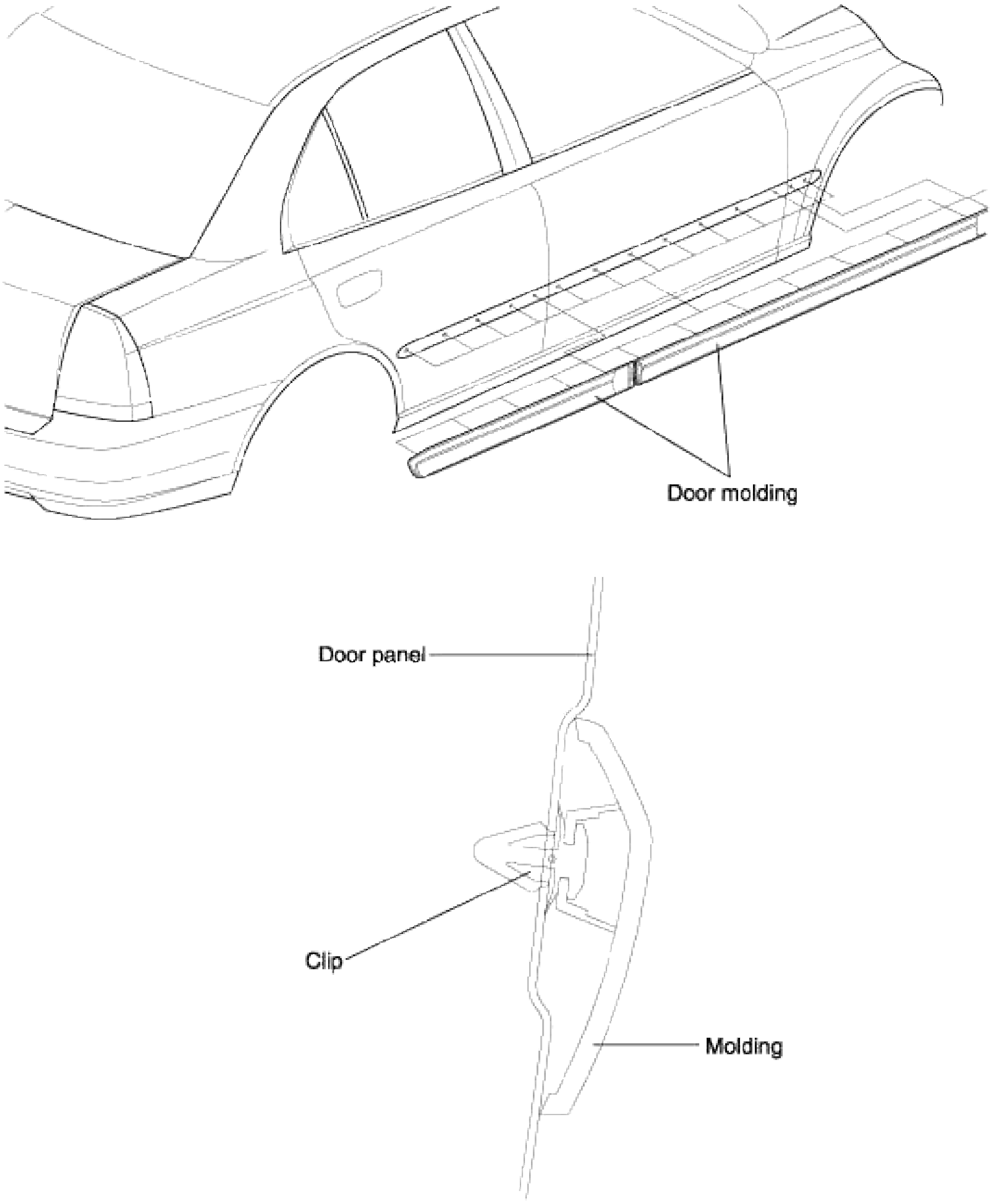
DOOR MOLDING

CAUTION

- Wear gloves to protect hands from injury.
- When using a screwdriver or equivalent, wrap it with protective tape to prevent damage.

NOTE

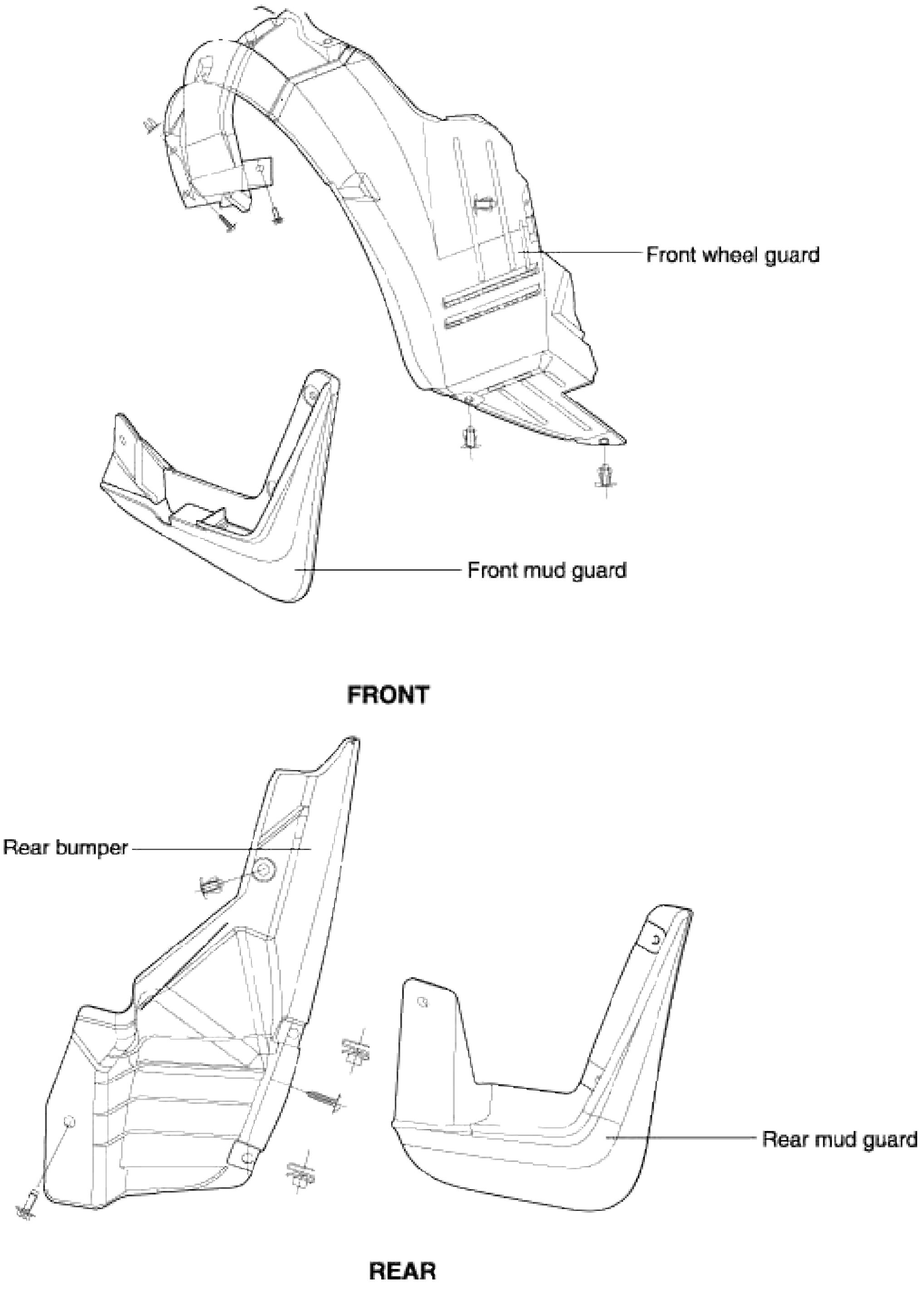
- Be careful not to scratch the body
- Do not reuse the damaged roof molding.


Door molding
Door panel
Clip
Molding

MUD GUARD AND WHEEL GUARD

NOTE

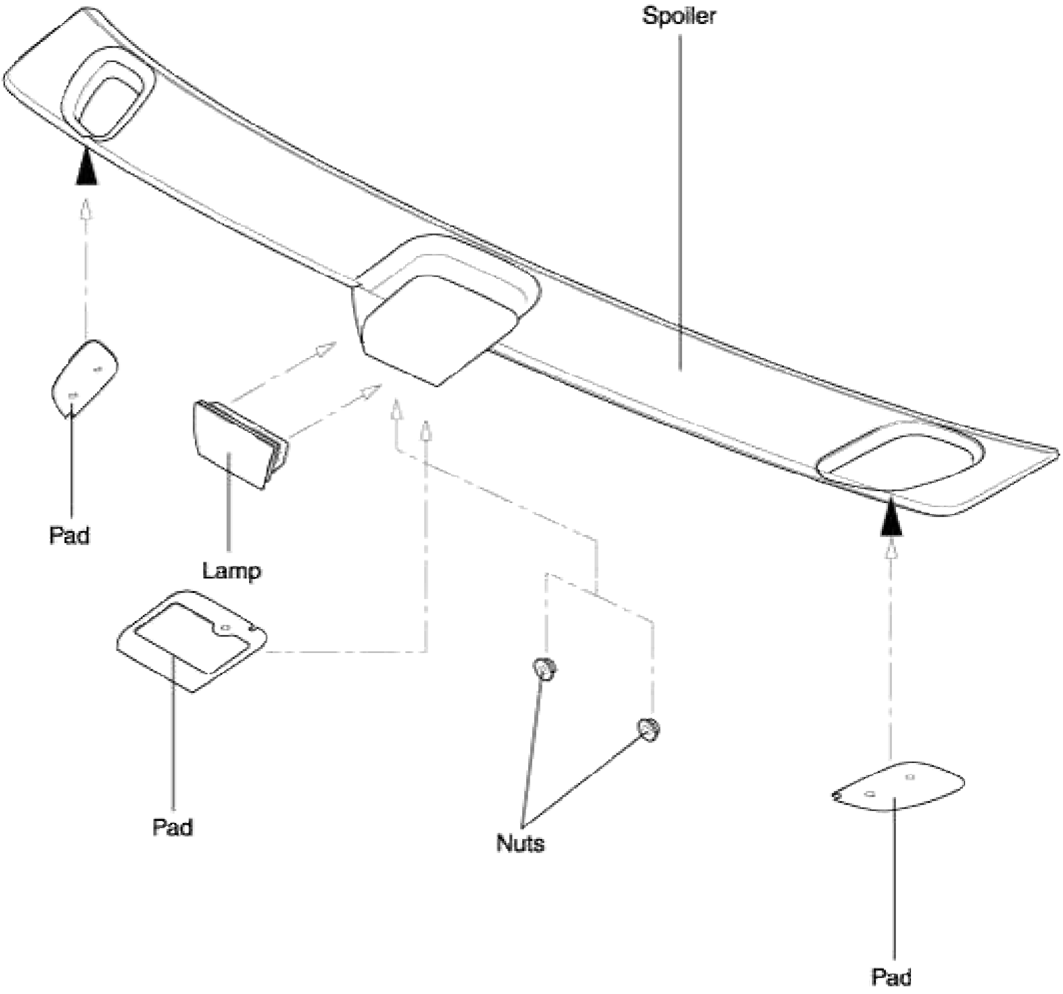
- Wear gloves to protect hands from injury.
- Do not reuse the damaged clip.


Front wheel guard
Front mud guard
FRONT
Rear bumper
Rear mud guard
REAR

SPOILER

NOTE

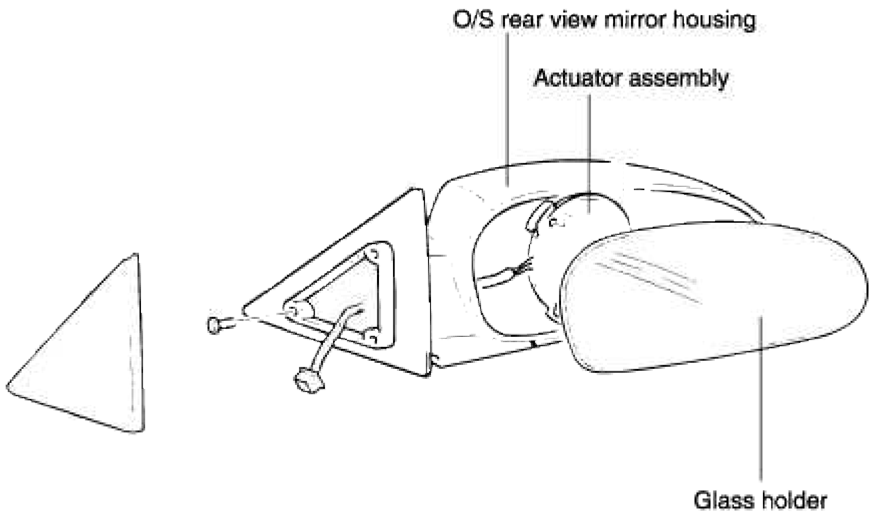
- Wear gloves to protect hands from injury.
- Be careful not to damage the body.


Spoiler
Pad
Lamp
Pad
Nuts
Pad

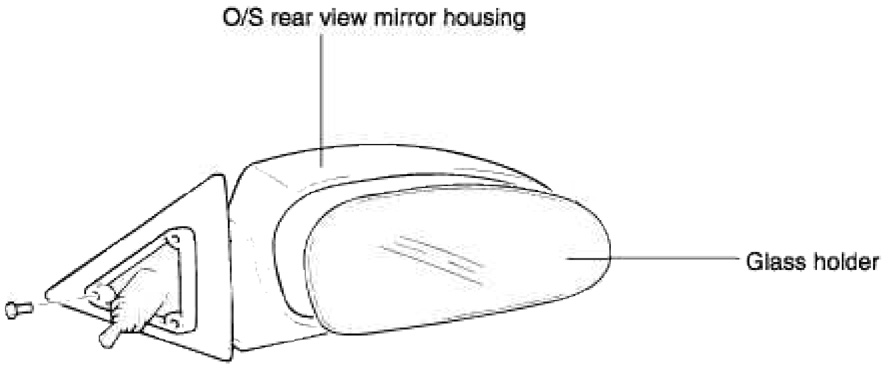
Body (Interior and Exterior) > Exterior > mirror > Components and Components Location

COMPONENTS

[ELECTRIC REMOTE CONTROL TYPE]


O/S rear view mirror housing
Actuator assembly
Glass holder

[MANUAL REMOTE CONTROL TYPE]


O/S rear view mirror housing
Glass holder

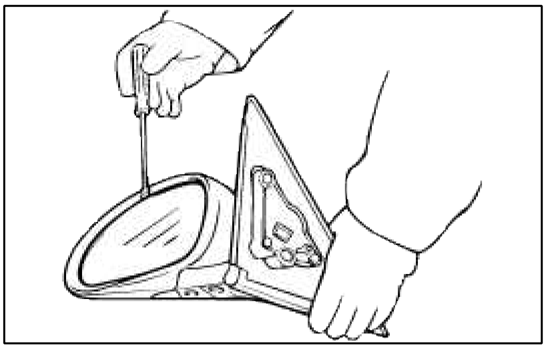
Body (Interior and Exterior) > Exterior > mirror > Repair procedures

REMOVAL AND INSTALLATION

CAUTION

Wear gloves to remove and install the mirror holder.

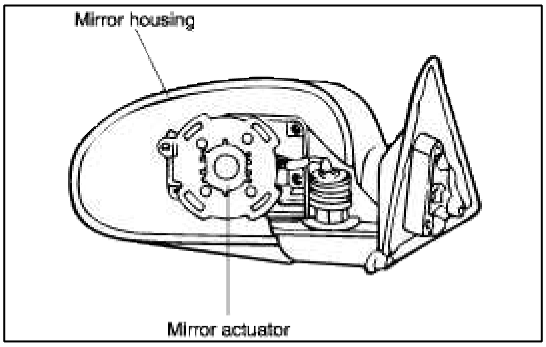
1. Insert flat tip (-) screwdriver between the outside rearview mirror holder and mirror assembly.



CAUTION

When prying with a flat tip screwdriver, wrap it with a shop towel to prevent damage.

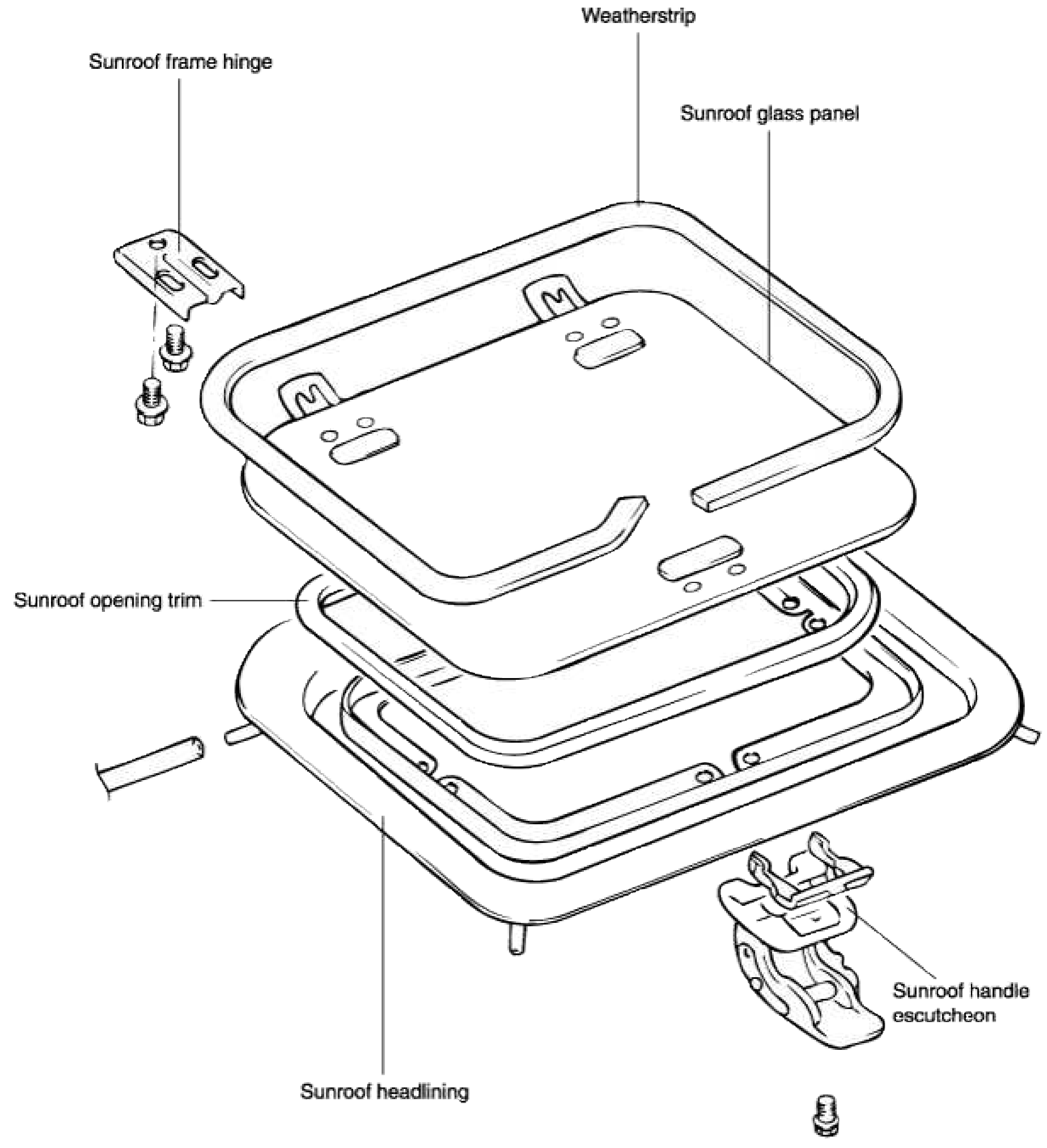
2. Remove the outside rearview mirror actuator from outside rearview mirror housing.



3. Installation is the reverse of removal.

Body (Interior and Exterior) > Sun Roof > sun roof assembly > Components and Components Location

COMPONENTS

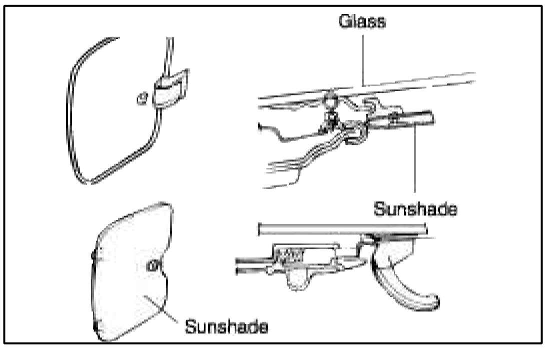

Weatherstrip
Sunroof frame hinge
Sunroof glass panel
Sunroof opening trim
Sunroof handle escutcheon
Sunroof headlining

Body (Interior and Exterior) > Sun Roof > sun roof assembly > Repair procedures

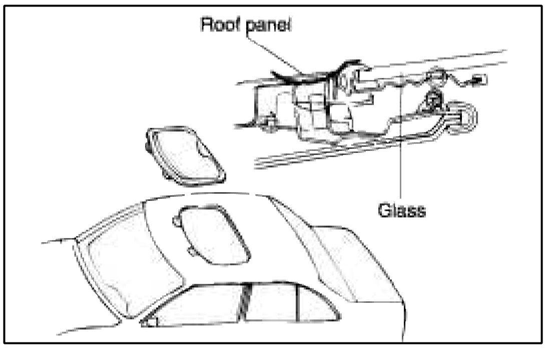
REMOVAL AND INSTALLATION

1. To remove the sunroof, first remove the following parts
    (1) Overhead console lamp assembly
    (2) Sunvisor and inside rear view mirror
    (3) Front pillar trim
    (4) Roof assist handle

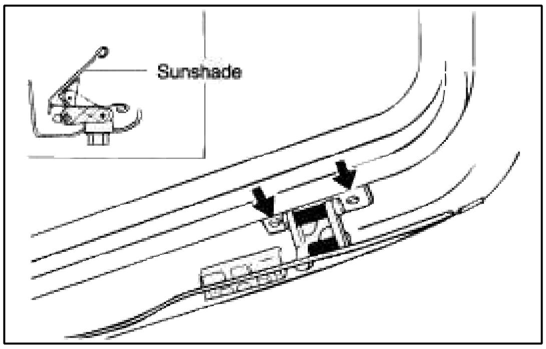
2. Remove the sunshade assembly from the sunroof glass.


Glass
Sunshade
Sunshade

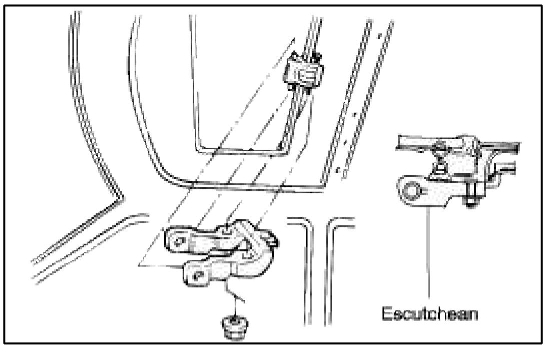
3. Remove the sunroof glass assembly from the frame hinge.


Roof panel
Glass

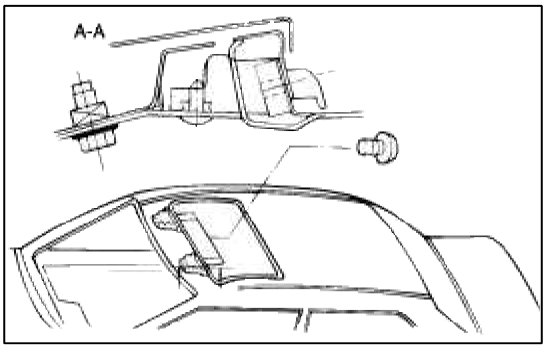
4. Remove the sunroof deflector.



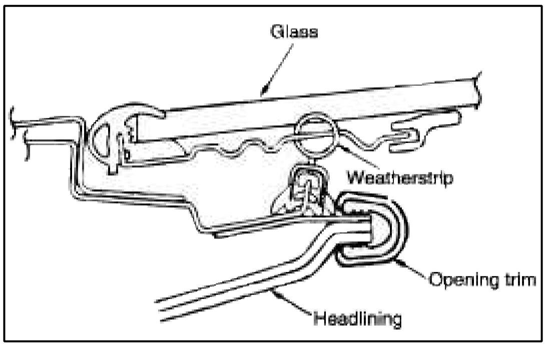
5. Remove the sunroof handle and the sunroof handle base plate.


Escutchean

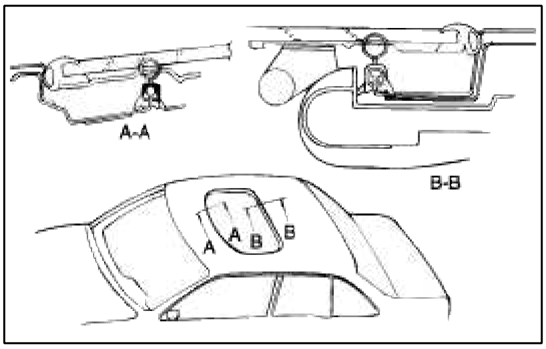
6. Remove the sunroof frame hinge.



7. Installation is the reverse of removal.

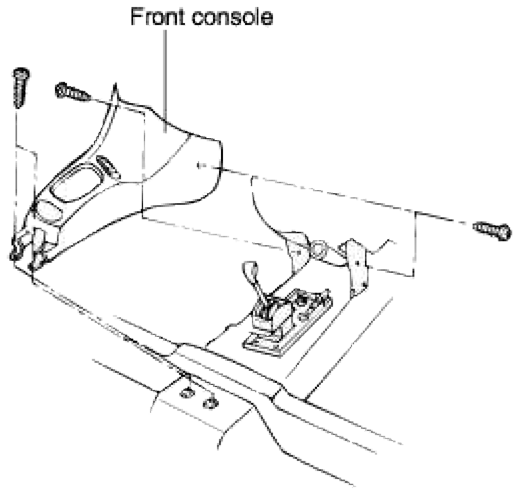

Glass
Weatherstrip
Opening trim
Headlining

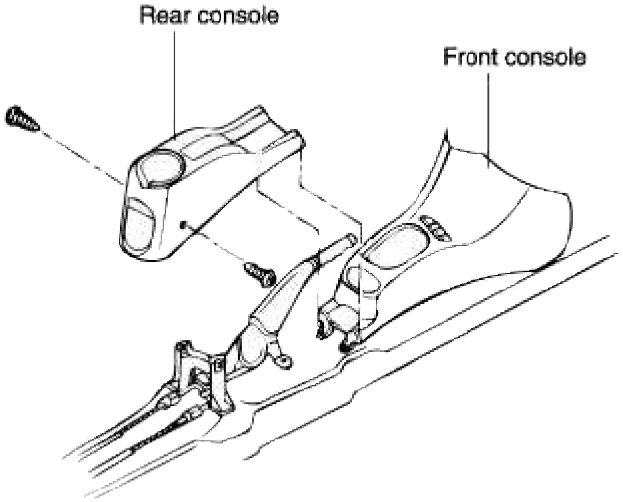
8. When installing the sunroof opening trim, make sure that there is no gap between the trim and the headlining.



Body (Interior and Exterior) > Interior > console > Components and Components Location

COMPONENTS

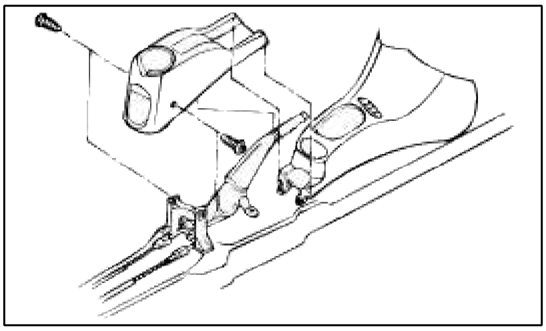

Front console


Rear console
Front console

Body (Interior and Exterior) > Interior > console > Repair procedures

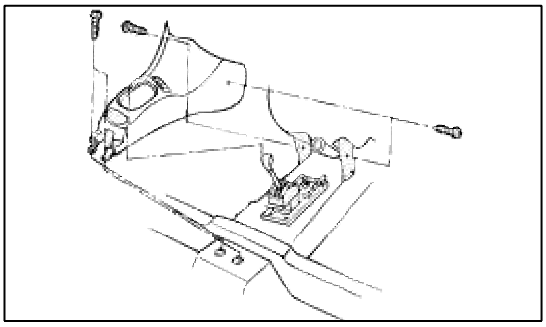
REMOVAL AND INSTALLATION

1. Remove the rear console mounting screws, and then pull out the rear console.



2. Remove the transaxle control lever.

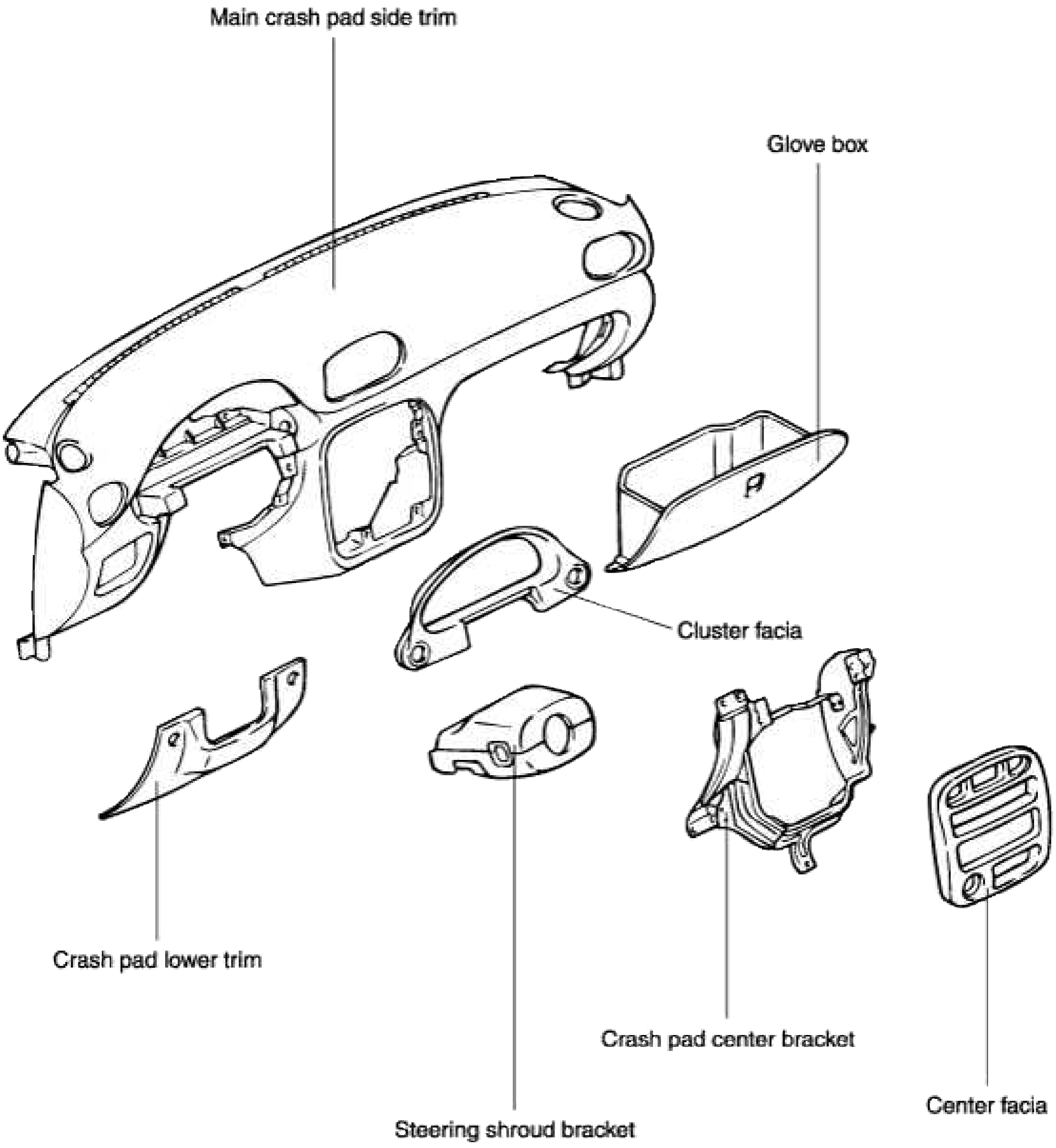
3. Remove the front console assembly and then disconnect the connectors.



4. Installation is the reverse of removal.

Body (Interior and Exterior) > Interior > crash pad > Components and Components Location

COMPONENTS


Main crash pad side trim
Glove box
Cluster facia
Crash pad lower trim
Crash pad center bracket
Center facia
Steering shroud bracket

Body (Interior and Exterior) > Interior > crash pad > Repair procedures

REMOVAL AND INSTALLATION

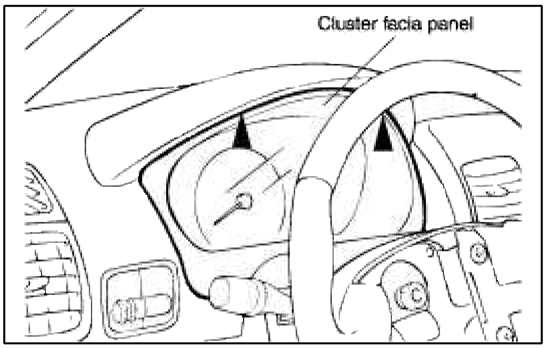
INSTRUMENT CLUSTER REMOVAL AND INSTALLATION

CAUTION

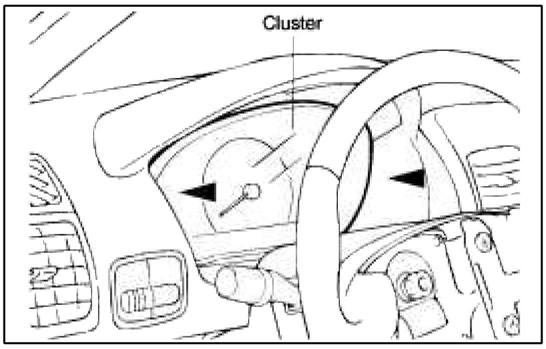
- When using a screwdriver or equivalent, wrap it with protective tape to prevent damage.
- Wear gloves to protect hands from injury.

1. Lower the steering column.

2. After loosening the mounting screw, remove the cluster facia panel using a screwdriver.



3. After loosening the cluster mounting screws, take out the cluster from the housing.



4. Installation is the reverse of removal.

CRASH PAD LOWER PANEL REMOVAL AND INSTALLATION

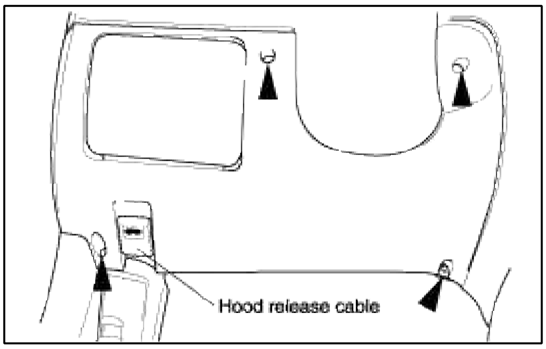
CAUTION

- When using a screwdriver or equivalent, wrap it with protective tape to prevent damage.
- Wear gloves to protect hands from injury.

NOTE

Be careful not to scratch the crash pad.

1. Raise the steering column.
2. Loosen the 4 mounting. Disconnect the self-diagnosis connector and hood release cable and remove the crash pad lower panel.



3. Installation is the reverse of removal.

GLOVE BOX REMOVAL AND INSTALLATION

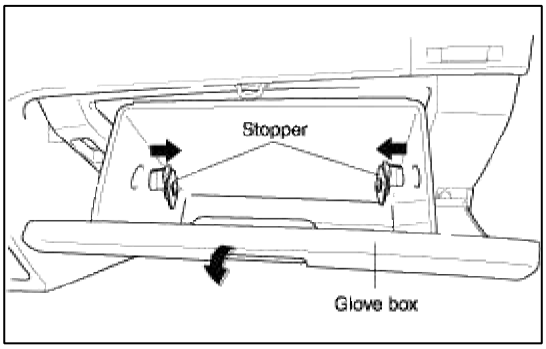
CAUTION

- When using a screwdriver or equivalent, wrap it with protective tape to prevent damage.
- Wear gloves to protect hands from injury.

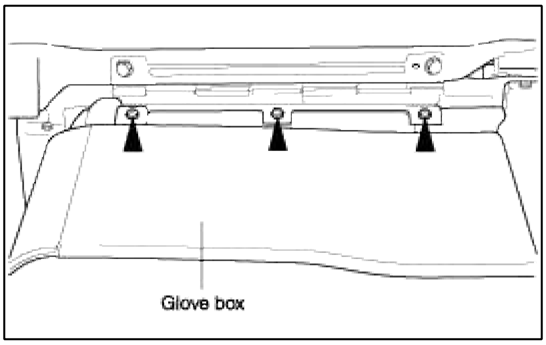
NOTE

Be careful not to scratch the crash pad.

1. Remove the glove box stopper.



2. After loosening the glove box mounting screws(3EA), remove the glove box.



3. Installation is the reverse of removal.

CENTER FACIA PANEL REMOVAL AND INSTALLATION

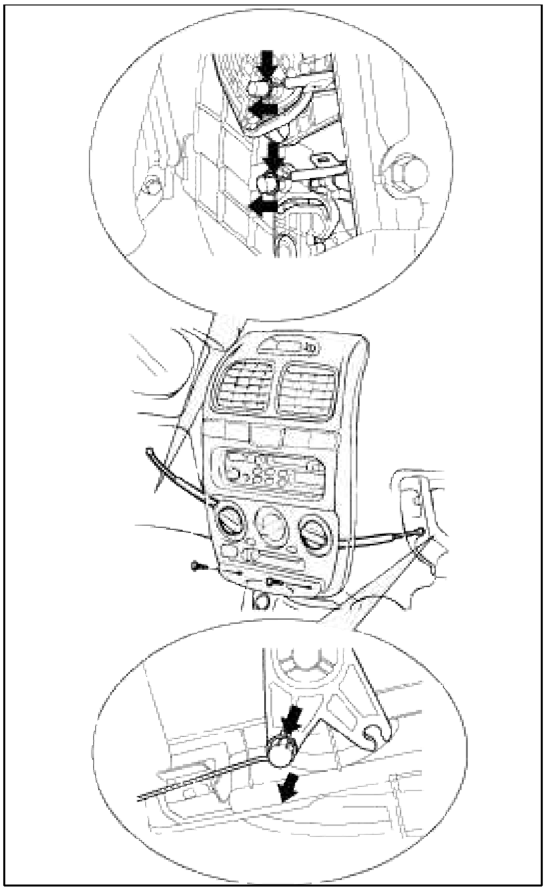
CAUTION

- When using a screwdriver or equivalent, wrap it with protective tape to prevent damage.
- Wear gloves to protect hands from injury.

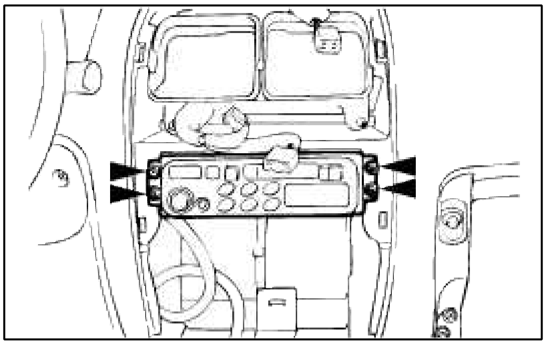
NOTE

Take care not to scratch the crash pad.

1. Remove the glove box.
2. Remove the crash pad lower panel. ("See Page BD-37")
3. Disconnect the intake control mode, mode control, and air mix control cable. Remove the center facia panel from the lower portion with a trim remover.



4. Loosen the 4 mounting screws and remove the audio assembly.



5. Installation is the reverse of removal.

MAIN CRASH PAD

CAUTION

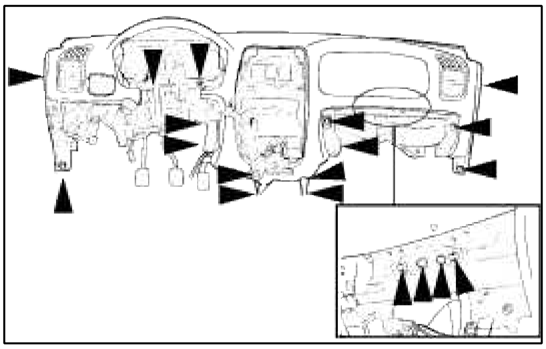
- When using a screwdriver or equivalent, wrap it with protective tape to prevent damage.
- Wear gloves to protect hands from injury.

NOTE

Be careful not to scratch the crash pad.

1. Remove the steering wheel and airbag module.
2. Remove the glove box. ("See Page BD-38")
3. Remove the crash pad lower panel. ("See Page BD-37")
4. Remove the center facia panel.("See Page BD-38")
5. Remove the audio assembly.
6. Remove the crash pad side trim.
7. Disconnect the antenna connecting connector.
8. After loosening the main crash pad mounting bolts, remove the main crash.

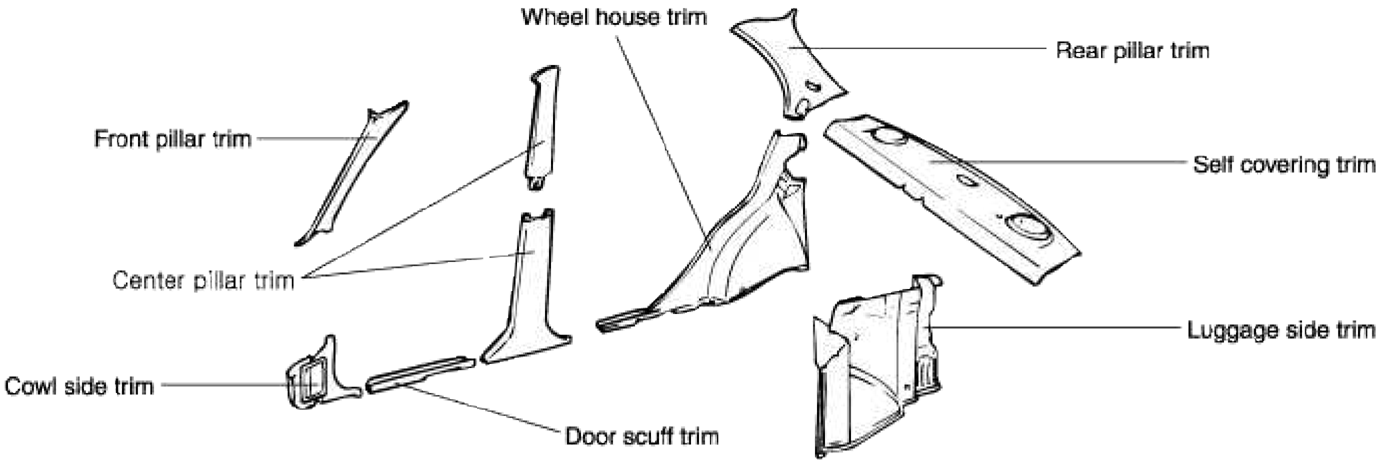
9. Installation is the reverse of removal.



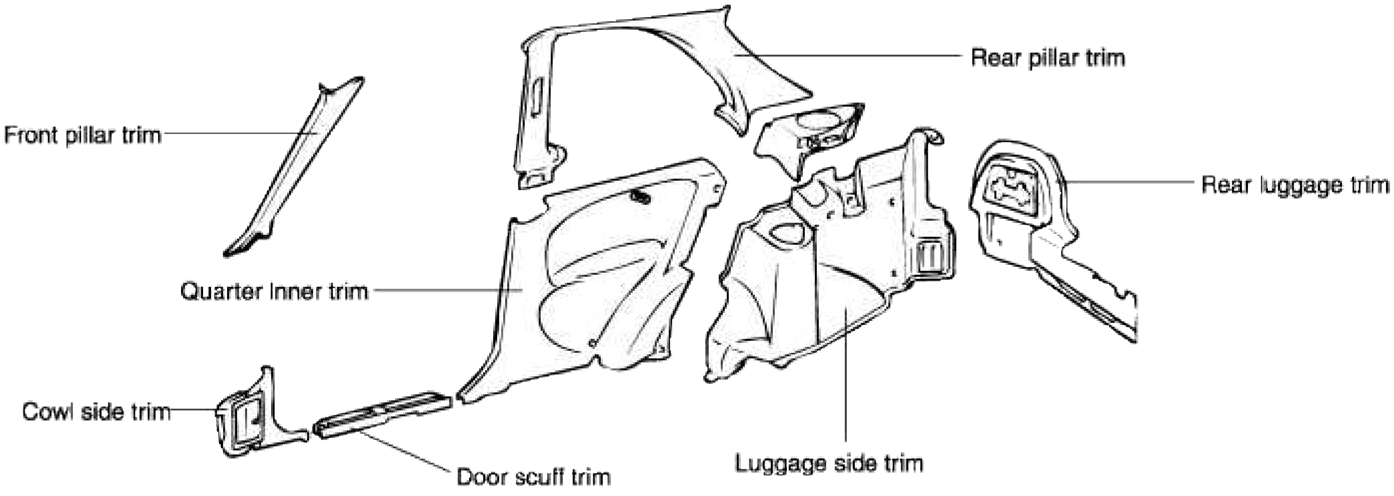
Body (Interior and Exterior) > Interior > interior trim > Components and Components Location

COMPONENTS

4-DOOR


Wheel house trim
Rear pillar trim
Front pillar trim
Self covering trim
Center pillar trim
Luggage side trim
Cowl side trim
Door scuff trim

3-DOOR


Rear pillar trim
Front pillar trim
Rear luggage trim
Quarter Inner trim
Cowl side trim
Door scuff trim
Luggage side trim

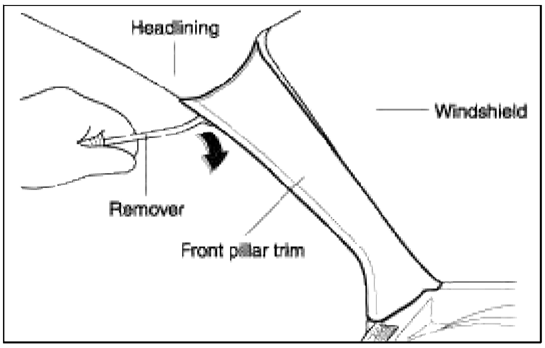
Body (Interior and Exterior) > Interior > interior trim > Repair procedures

REMOVAL AND INSTALLATION

NOTE

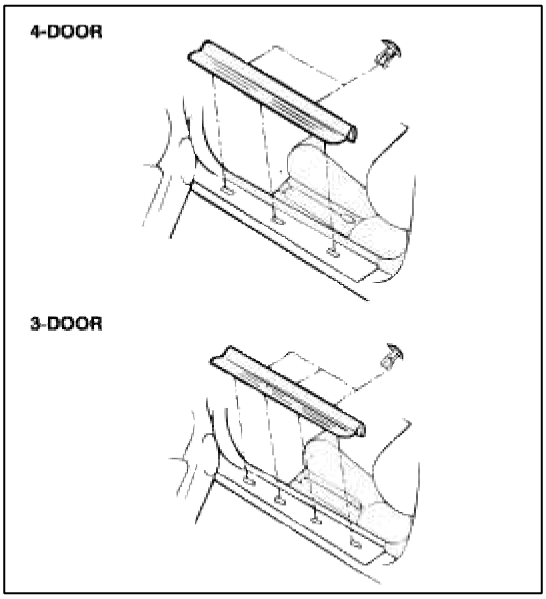
Prior to removing the trim, remove the outside weatherstrip.

FRONT PILLAR TRIM


Headlining
Windshield
Remover
Front pillar trim

FRONT DOOR SCUFF TRIM

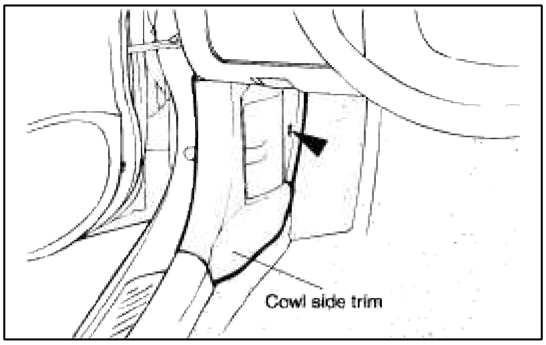
1. After disengaging the trim mounting clips, remove the front door scuff trim.


4-DOOR
3-DOOR

2. Installation is the reverse of removal.

COWL SIDE TRIM

1. Remove the front door scuff trim.
2. After disengaging the cowl side trim mounting clip, remove the cowl side trim.

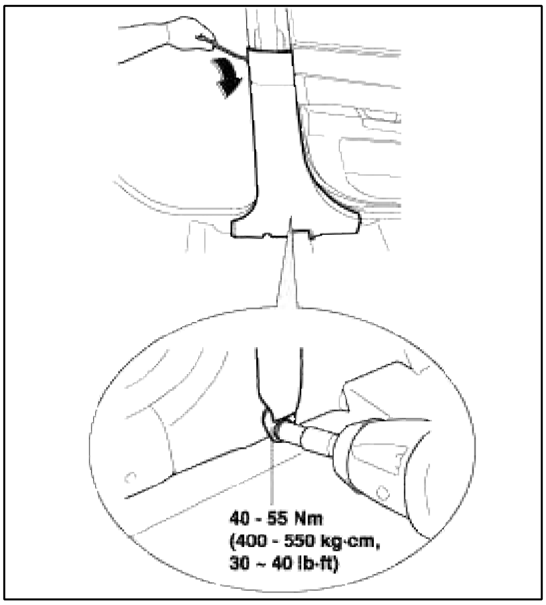

Cowl side trim

3. Installation is the reverse of removal.

CENTER PILLAR LOWER TRIM

1. Remove the front door scuff trim.

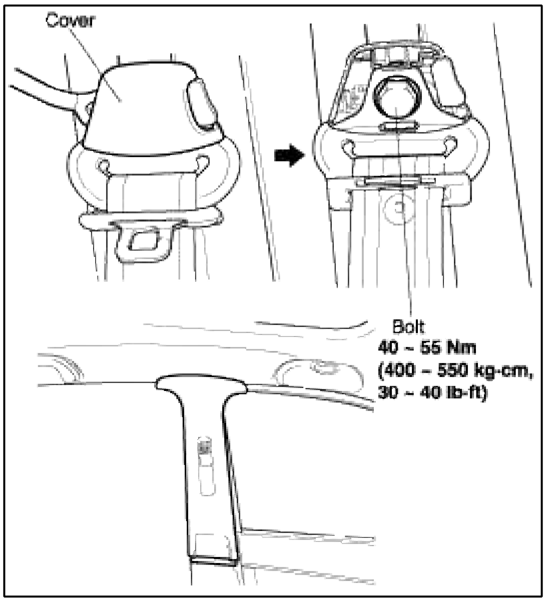
2. After removing the front seat belt lower anchor bolt and clip, remove the center pillar lower trim.


40 - 55 Nm
(400 - 550 kg·cm,
30 ~ 40 lb·ft)

3. Installation is the reverse of removal.

CENTER PILLAR UPPER TRIM

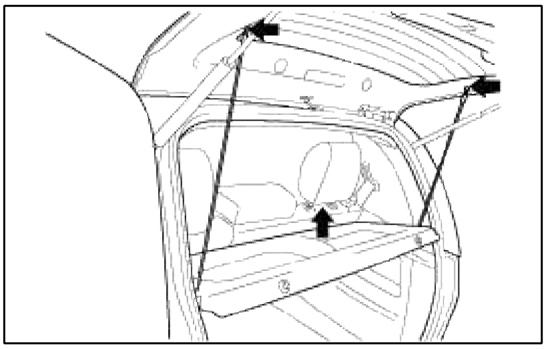
1. Remove the front door scuff trim. ("See Page BD-41")
2. Remove the center pillar lower trim. ("See Page BD-41")
3. Remove the front seat belt upper anchor cover, loosen the anchor mounting bolt, and remove the center pillar upper trim.


Cover
Bolt
40 ~ 55 Nm
(400 ~ 550 kg-cm,
30 ~ 40 lb-ft)

4. Installation is the reverse of removal.

COVERING SELF TRIM

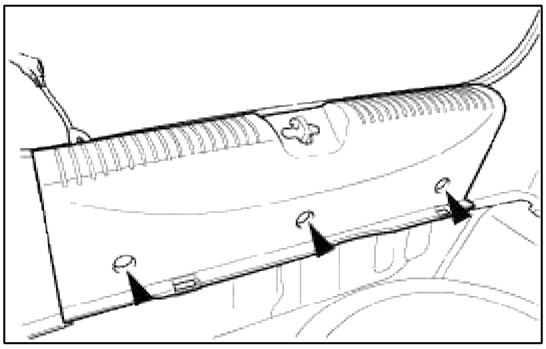
1. Detach the mounting wire, remove the covering self trim by pulling it upward.



2. Installation is the reverse of removal.

REAR TRANSVERSE TRIM

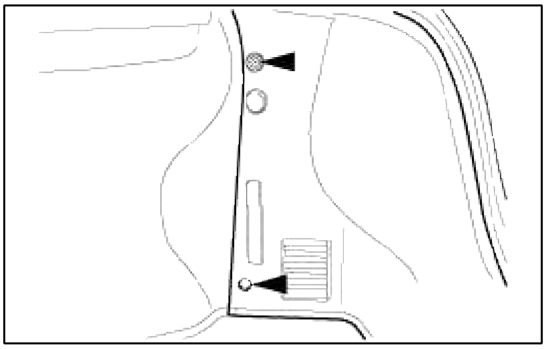
1. Remove the covering self trim.
2. Remove the luggage cover mat.
3. After loosening the transverse trim mounting screws(3EA), remove the transverse trim.



4. Installation is the reverse of removal.

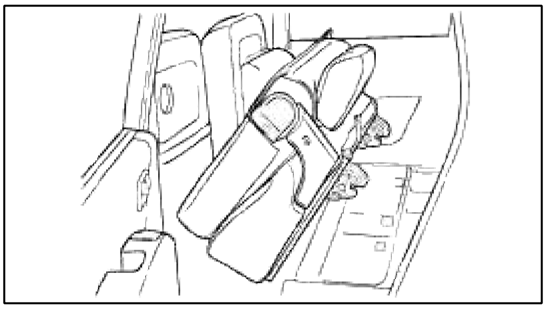
LUGGAGE REAR TRIM

1. Remove the rear transverse trim.
2. After loosening the luggage rear trim mounting screws(2EA), remove the luggage rear trim.



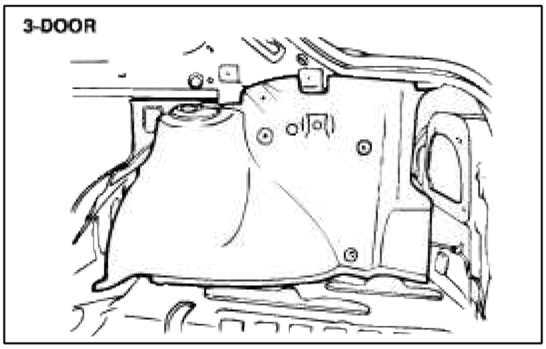
LUGGAGE SIDE TRIM

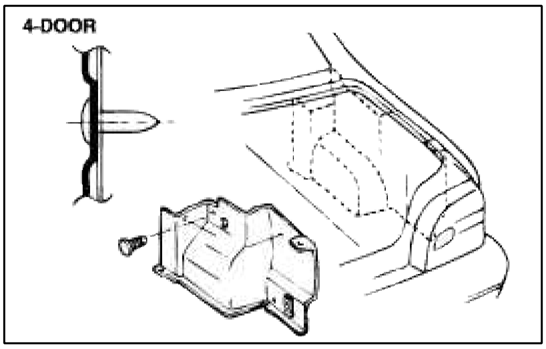
1. Raise the rear seat.



2. Remove the luggage cover mat.
3. Remove the rear transverse trim.
4. Remove the wheel house trim.

5. Remove the screws, clips and then luggage side trim.

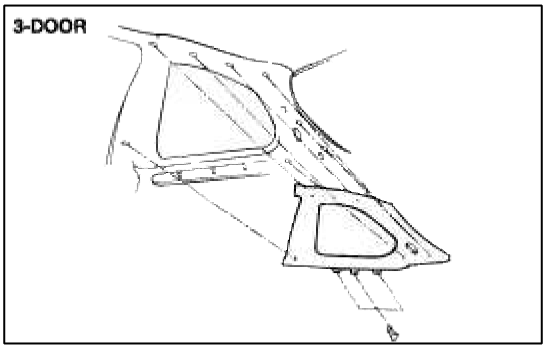


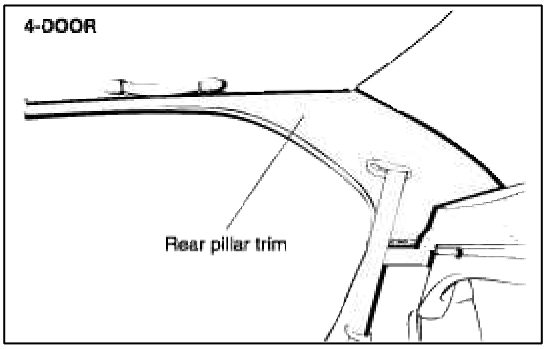


6. Installation is the reverse of removal.

REAR PILLAR TRIM

1. Remove the rear pillar trim using a trim remover.

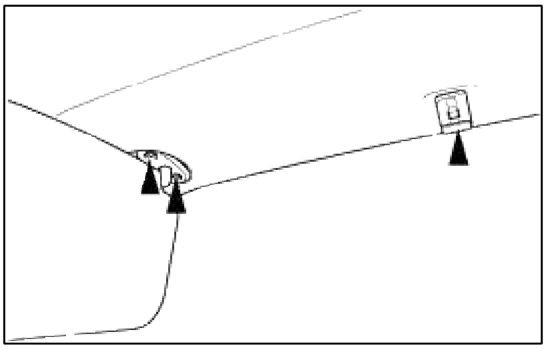



4-DOOR
Rear pillar trim

2. Installation is the reverse of removal.

SUNVISOR

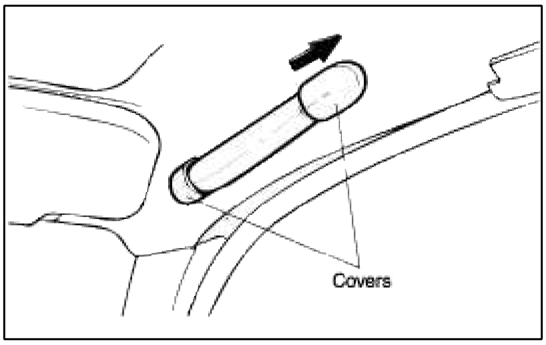
1. Loosen the sunvisor mounting screws(2EA) and holder mounting screw, then remove the sunvisor and holder.



2. Installation is the reverse of removal.

GRAB HANDLE

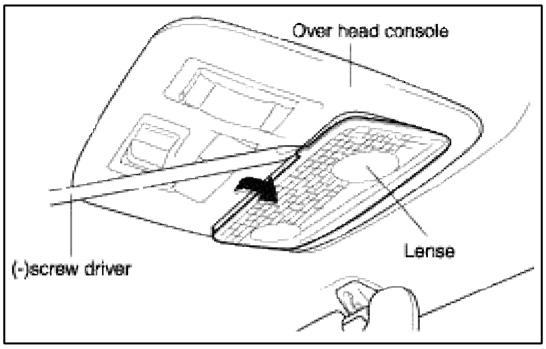
1. Peel both grab handle covers, loosen the 2 mounting bolts and remove the grab handle.



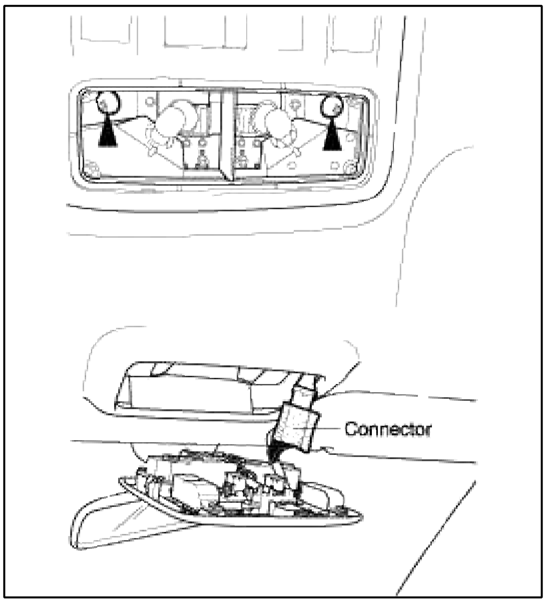
2. Installation is the reverse of removal.

OVERHEAD CONSOLE

1. Remove the ceiling light cover.


Over head console
Lense
(-)screw driver

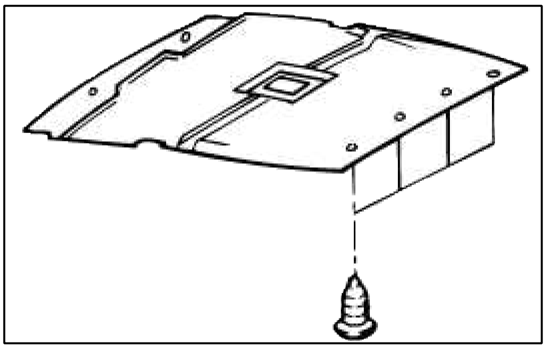
2. Loosen the 2 mounting screws, disconnect the connector, and then remove the overhead console.

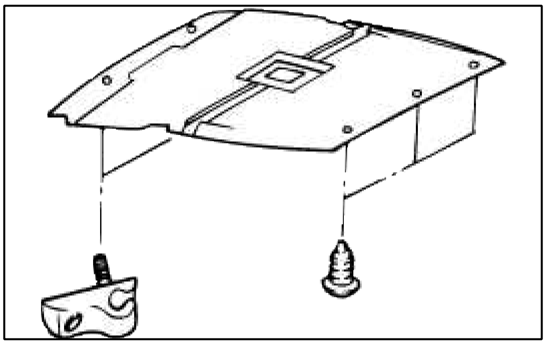


3. Installation is the reverse of removal.

HEAD LINING

1. Prior to removing the headlining, remove the following items.
   - A. Front seat
   - B. Rear seat
   - C. Overhead console
   - D. Front pillar trim
   - E. Front door scuff trim
   - F. Rear door scuff trim
   - G. Front seat belt
   - H. Center pillar lower, upper trim
   - I. Rear seat belt lower anchor
   - J. Transverse trim
   - K. Rear center seat belt anchor
   - L. Luggage side trim
   - M. Rear pillar trim
   - N. Sunvisor and Grab handles
2. After detaching the headlining mounting clips, remove the headlining.

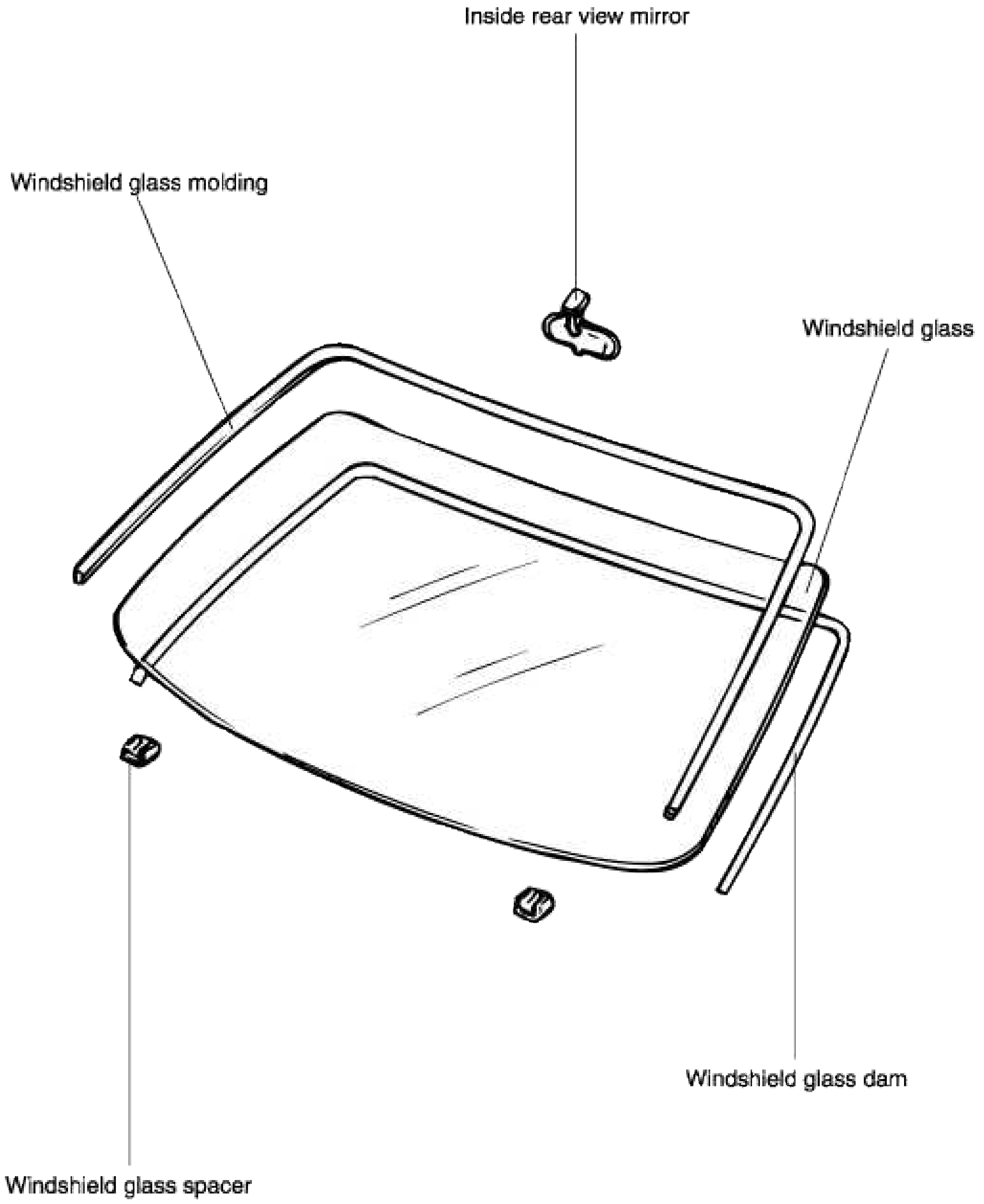




3. Installation is the reverse of removal.

Body (Interior and Exterior) > Interior > windshield glass > Components and Components Location

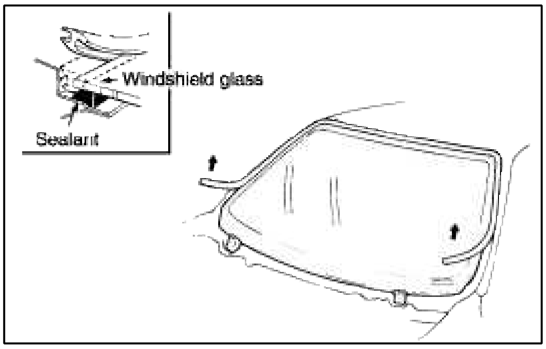
COMPONENTS


Inside rear view mirror
Windshield glass molding
Windshield glass
Windshield glass dam
Windshield glass spacer

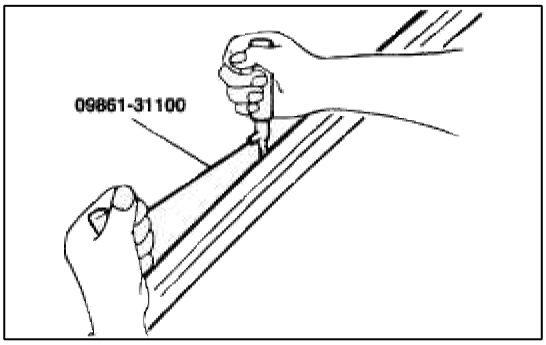
Body (Interior and Exterior) > Interior > windshield glass > Repair procedures

REMOVAL

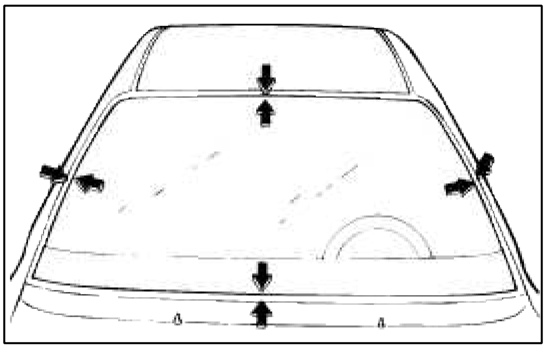
1. To remove the windshield, first remove the following parts
   (1) Front pillar trims
   (2) Inside rear view mirror
   (3) Wiper arms
   (4) Weatherstrip and cowl top cover
   (5) Windshield glass molding


Windshield glass
Sealant

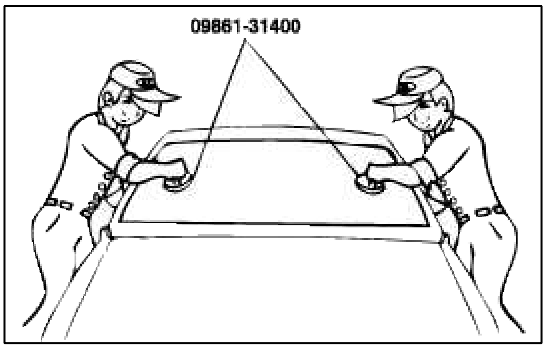
2. Use the special tool (09861-31100) to cut through the sealant.


09861-31100

3. Make mating marks on the glass and body if the glass is to be reinstalled.

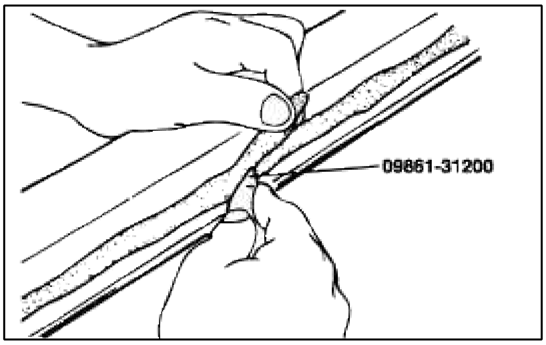


4. Take out the windshield glass with the special tool (09861-31400).

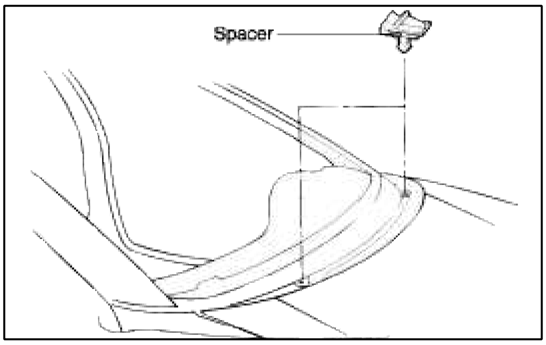

09861-31400

INSTALLATION

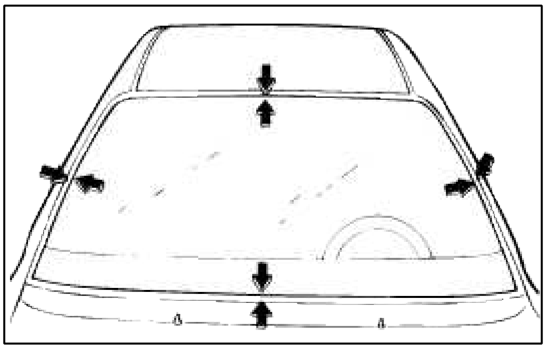
1. Using a cutter knife or the special tool (09861-31200), scrape the old sealant smoothly to a thickness of about 2 mm (0.08 in.) on the bonding surface around the entire windshield flange.

> **CAUTION**
>
> Be careful not to remove more adhesive than necessary, and also not to damage the paintwork on the body surface with the knife. If the paintwork is damaged, repair the damaged area with touch-up paint.
>
> 
>

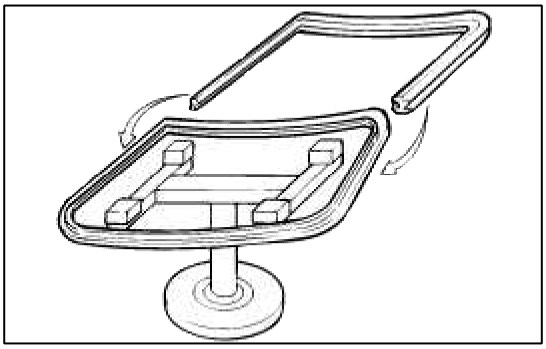
2. Clean the body bonding surface with a sponge dampened in alcohol or wax and grease remover.
3. Install the spacer in the windshield aperture.



4. Center a new windshield glass in the opening. Mark the location by marking lines across the glass and body with a grease pencil at the four points as shown.

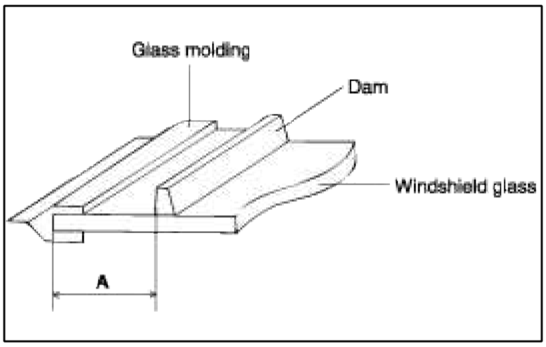


5. Install the windshield glass molding without any gaps.



6. Glue the rubber dam to the inside surface of the windshield glass around the entire edge as shown, to contain the sealant during installation.

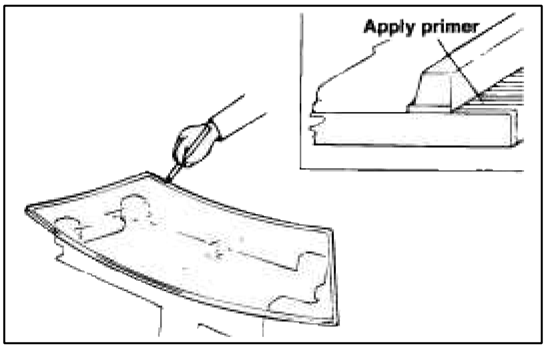
Part	"A"	Remarks
Upper	13.5 mm	Glass molding sub
Side	13.5 mm	
Lower	27 mm	



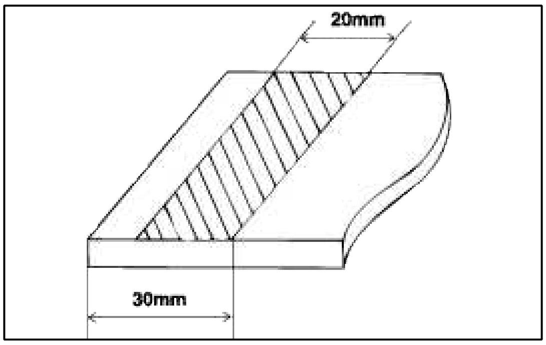
7. Apply a light coat of glass primer to the outside of the dam.

NOTE

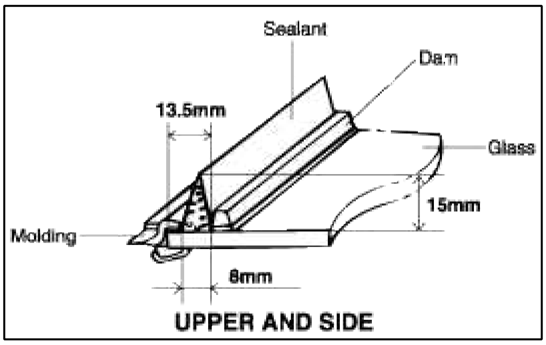
1. Never touch the surface applied primer with your hand.
   If you do, the adhesive may not bond to the glass properly, causing a leak after the windshield glass is installed.
2. Do not apply body primer to the glass.
3. Keep water, dust, and abrasive materials away from the surface applied primer.

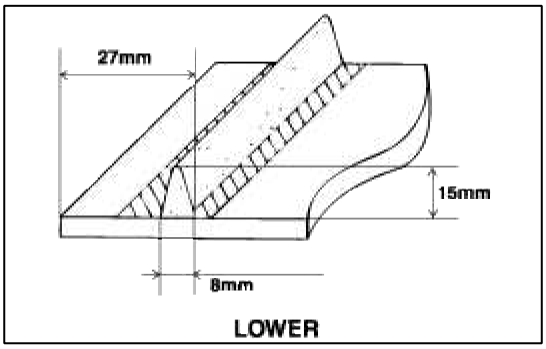


8. Apply a primer to the lower glass as shown.



9. Apply a sealant around the edge of the glass.

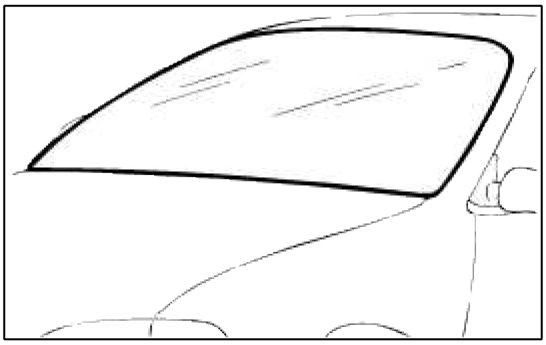

Sealant
Dam
13.5mm
Glass
15mm
Molding
8mm
UPPER AND SIDE


27mm
15mm
8mm
LOWER

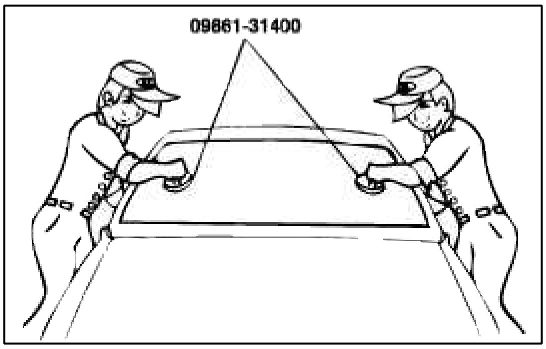
NOTE

Apply the adhesive within 5 minutes after applying the primer to the glass.

10. Apply a light coat of body primer to the original sealant remaining around the window opening flange. The glass should be installed within 5 minutes after you apply the primer.

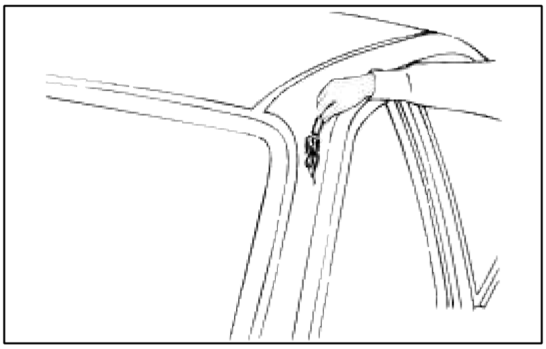


11. Using suction cups or the special tool (09861-31400), lower the glass over the opening, align it with the marks made in step 4 and set it down on the sealant.


09861-31400

12. Scrape or wipe excess adhesive off with a putty knife or gauze. Fill all cavities around the windshield glass.
13. Perform a water-leak test for the windshield. Use a cold water spray, being careful not to direct a powerful stream of water on the new adhesive material. Allow water to spill over the edges of the glass.

14. If there are leaks, dry the affected area, then apply sealant.



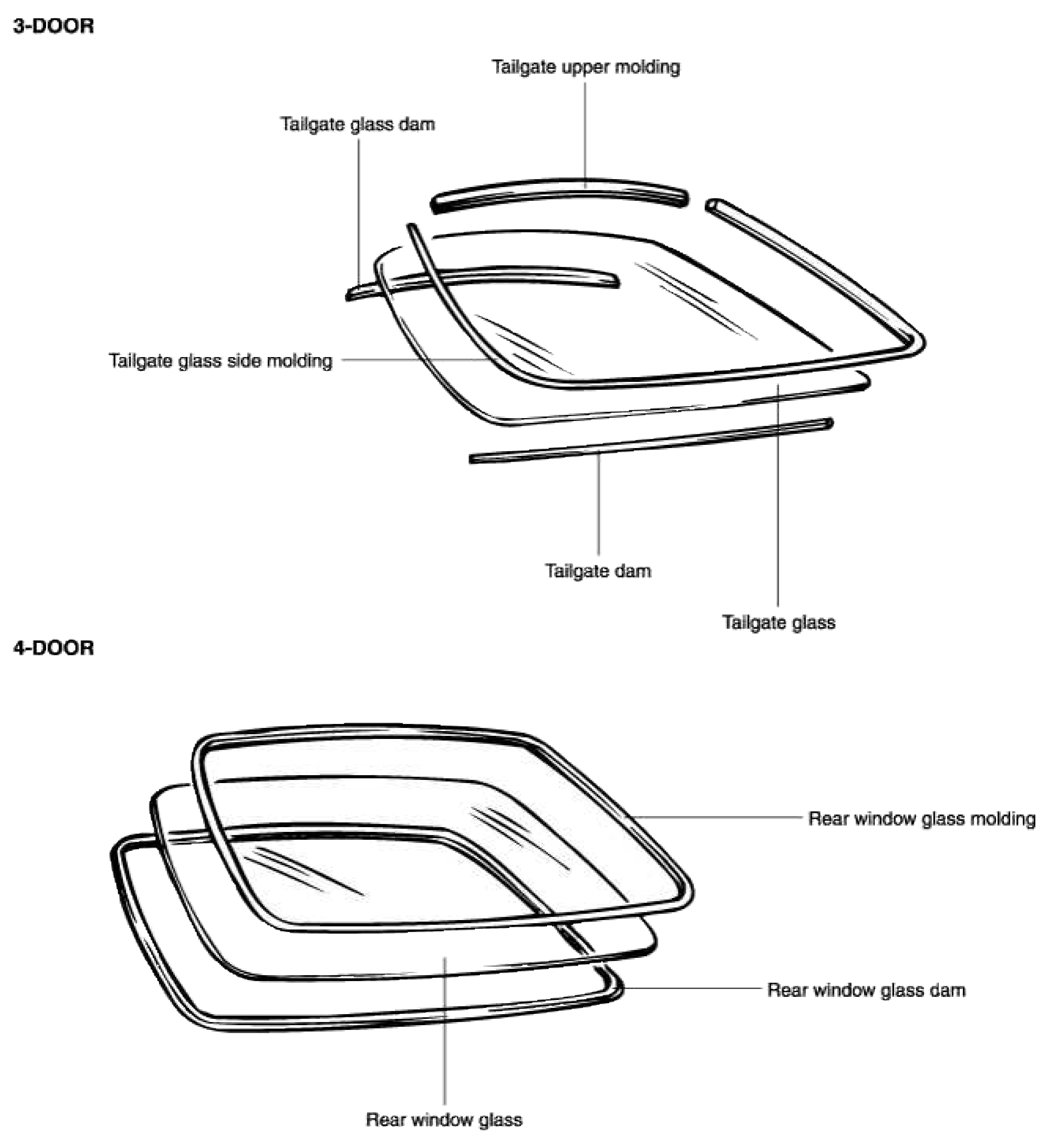
15. Install the removed parts.

CAUTION

1. Keep the windshield dry for the first hour after installation.
2. Let the car stand for at least four hours after windshield installation. If the car has to be used winthin the first 8 hours, it must be driven slowly.
3. Be careful not to slam the doors with all the windows rolled up.
4. Be careful not to twist the vehicle excessively (such as when going in and out of driveways at an angle or driving over rough, uneven roads).

Body (Interior and Exterior) > Interior > tailgate glass > Components and Components Location

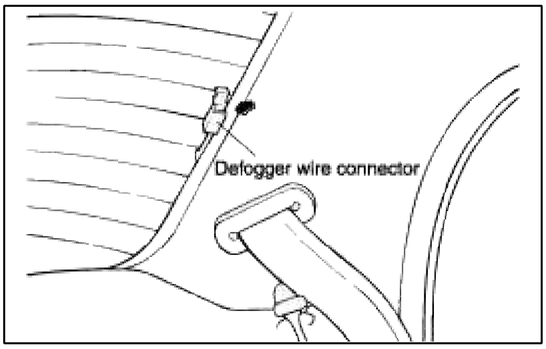
COMPONENTS


3-DOOR
Tailgate upper molding
Tailgate glass dam
Tailgate glass side molding
Tailgate dam
Tailgate glass
4-DOOR
Rear window glass molding
Rear window glass dam
Rear window glass

Body (Interior and Exterior) > Interior > tailgate glass > Repair procedures

REMOVAL

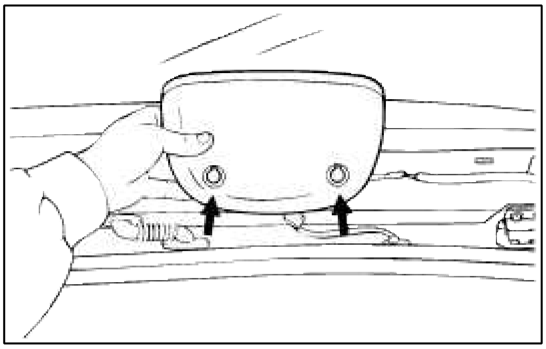
1. To remove the tailgate glass, first remove the following parts :
   (1) Rear window defogger wire connector.



   (2) Tailgate trims.

   (3) Rear wiper and wiper motor.

   (4) High mounted stop lamp.

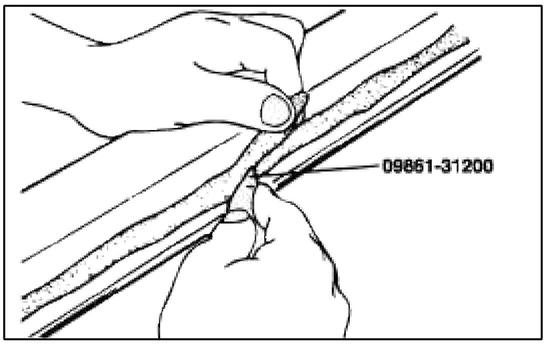


2. Remove the tailgate glass in the same manner as the windshield glass.

INSTALLATION

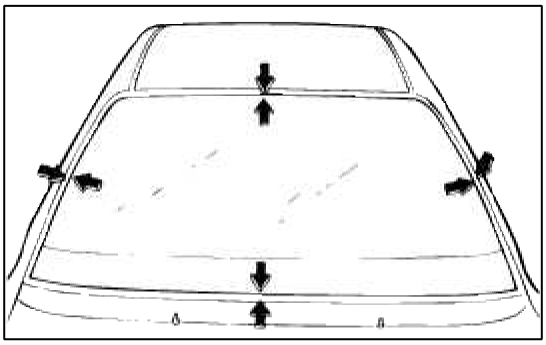
1. Using a cutter knife or the special tool (09861-31200), scrape the old sealant smoothly to a thickness of about 2 mm (0.08 in.) on the bonding surface around the entire tailgate glass.

> **CAUTION**
>
> Be careful not to remove more adhesive than necessary, and also not to damage the paintwork on the body surface with the knife. If the paintwork is damaged, repair the damaged area with touch-up paint.



2. Clean the body bonding surface with a sponge dampened in alcohol or wax and grease remover.

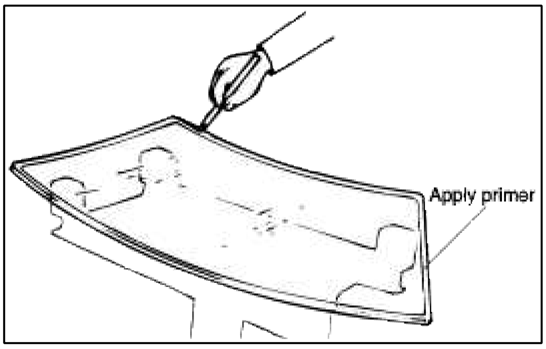
3. Center a new tailgate glass in the opening. Mark the location by marking lines across the glass and body with a grease pencil at the four points as shown.



4. Install the tailgate glass molding without any gaps.
5. Apply a light coat of glass primer around the tailgate glass.

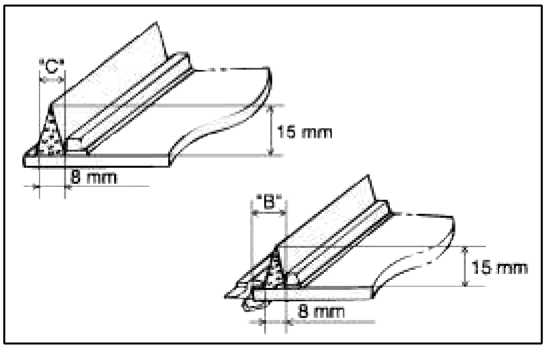
NOTE

1. Never touch the surface applied primer with your hands.
   If you do, the adhesive may not bond to the glass properly, causing a leak after the tailgate glass has been installed.
2. Do not apply body primer to the glass.
3. Keep water, dust, and abrasive materials away from the surface applied primer.



6. Apply a sealant around the edge of the glass.

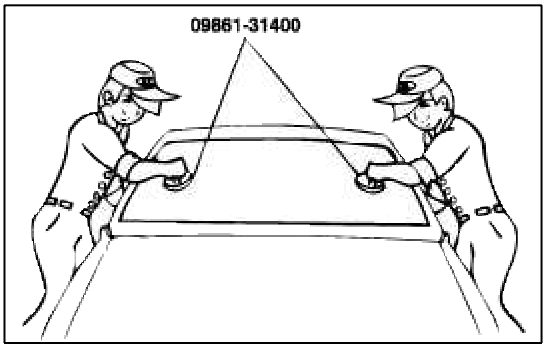
Part	"B" (4DR)		"C" (3DR)	
Upper	13.5 mm	Glass molding sub	23 mm	-
Side	13.5 mm			
Lower	13.5 mm		24 mm	-



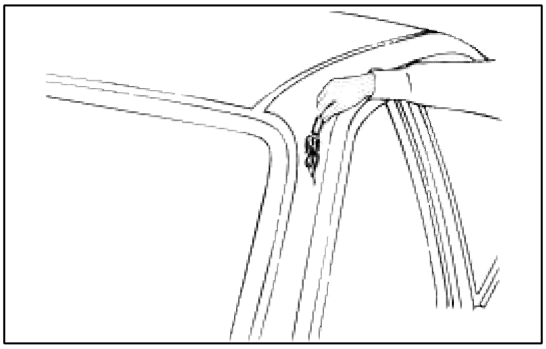
NOTE

Apply the adhesive within 5 minutes after applying the primer to the glass.

7. Apply a light coat of body primer to the original sealant remaining around the window opening flange. The glass should be installed within 5 minutes after you apply the primer.
8. Use suction cups or the special tool (09861-31400), lower the glass over the opening, align it with the marks made in step 3 and set it down on the sealant.



9. Scrape or wipe excess adhesive off with putty knife or gauze. Fill all cavities around the tailgate glass.
10. Perform a water-leak test for the tailgate glass. Use a cold water spray, being careful not to direct a powerful stream of water on the new adhesive material. Allow water to spill over the edges of the glass.



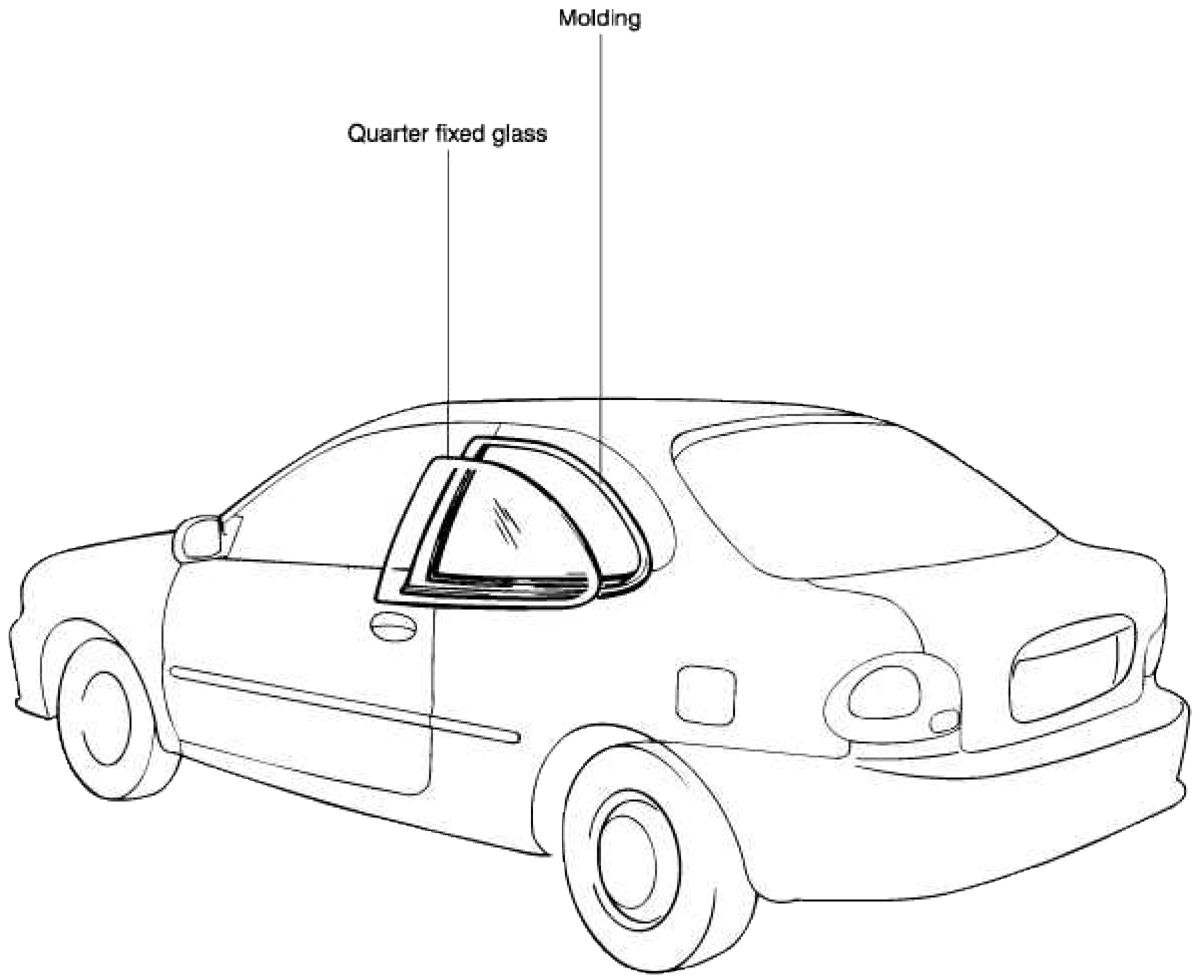
11. If there are leaks, dry the affected area, then apply sealant.
12. Install the removed parts.

CAUTION

1. Keep the tailgate glass dry for the first hour after installation.
2. Let the car stand for at least four hours after tailgate glass installation. If the car has to be used winthin the first 8 hours, it must be driven slowly.
3. Take care not to slam the doors with all the windows rolled up.
4. Take care not to twist the vehicle excessively (such as when going in and out of driveways at an angle or driving over rough, uneven roads).

Body (Interior and Exterior) > Interior > quarter glass > Components and Components Location

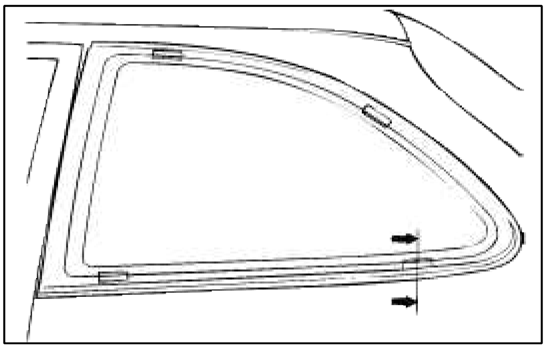
COMPONENTS


Molding
Quarter fixed glass

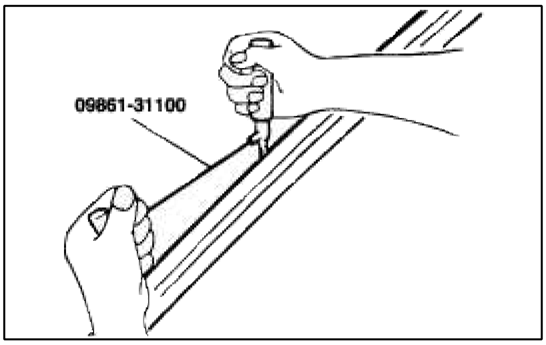
Body (Interior and Exterior) > Interior > quarter glass > Repair procedures

REMOVAL

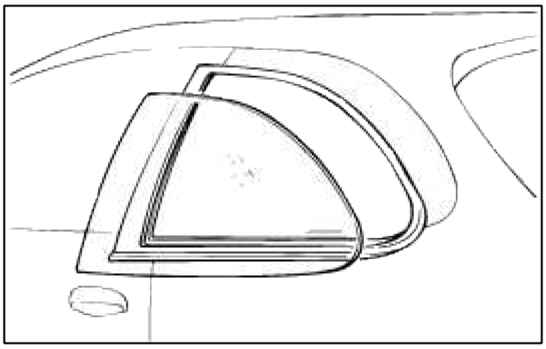
1. Remove the center pillar upper trim and the quarter inner trim, then loosen the glass moulding installing nuts.



2. After removing the quarter fixed glass moulding, cut the sealant using the special tool.

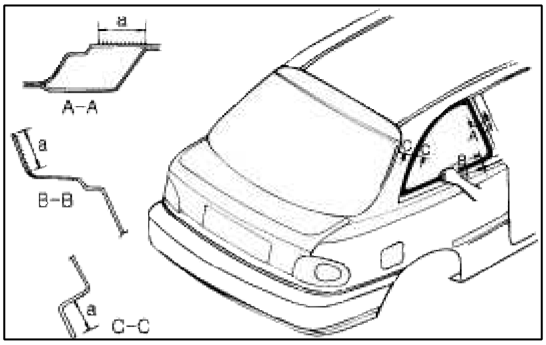

09861-31100

3. Remove the quarter fixed glass.

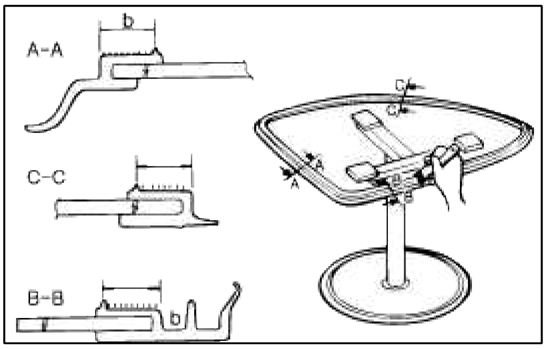


INSTALLATION

1. Clean the quarter fixed glass moulding assembly with gause.


a
A–A
a
B–B
a
C–C
C
C
A
A
B
B

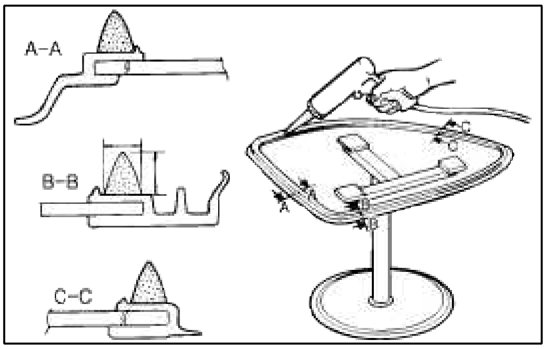
2. Apply a primer to the glass and the glass moulding assembly.


A–A
b
C–C
B–B
b
C
C
A
A
B
B

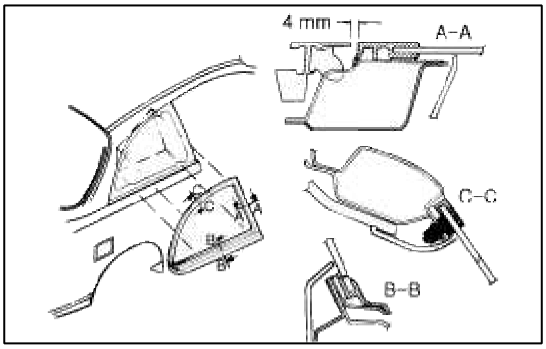
3. Apply the sealant to the entire circumference of the glass.

NOTE

Install the glass to the body within five minutes.

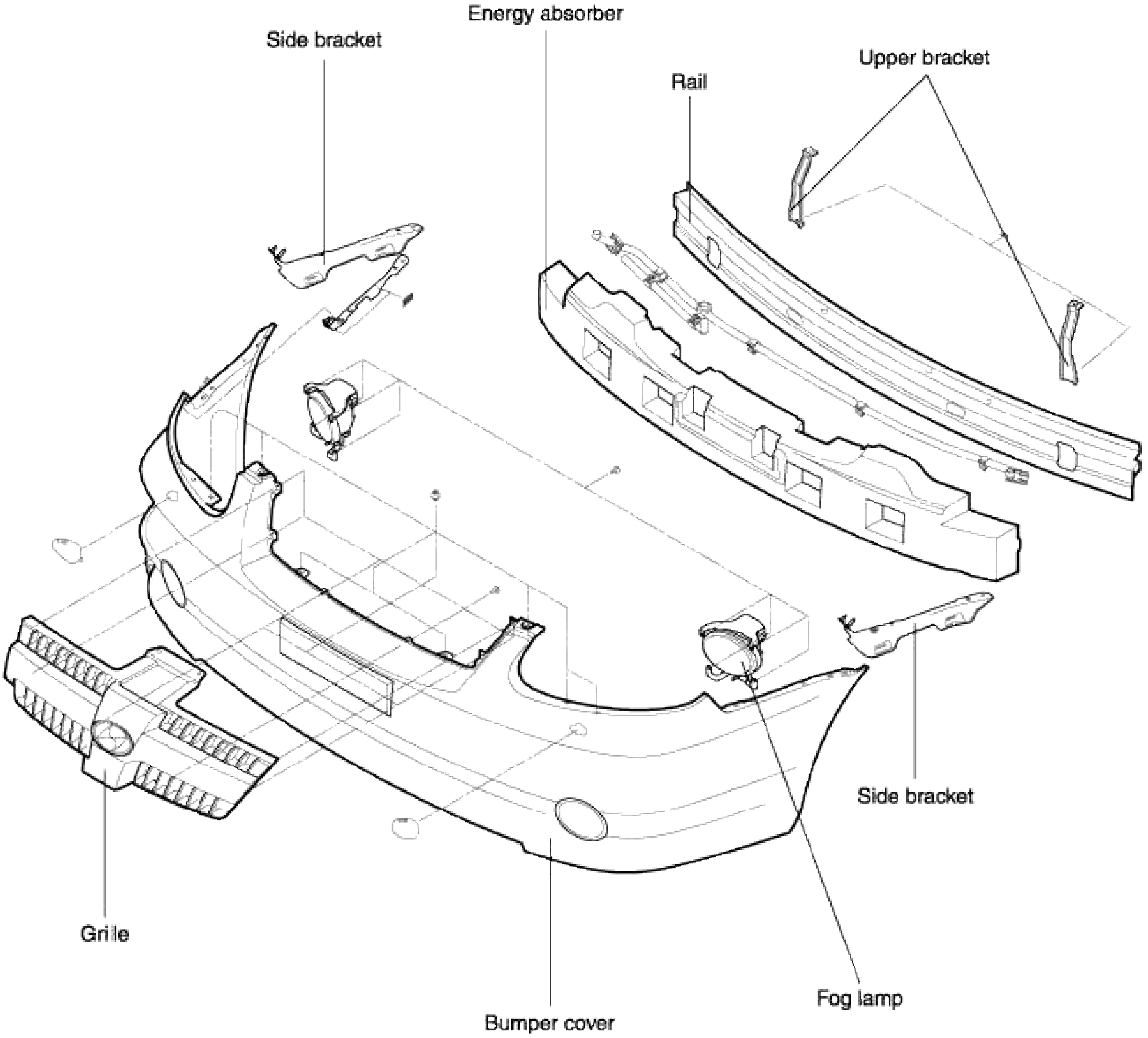


4. To install the quarter fixed glass, tighten the glass moulding installing nuts. After setting it to the quarter fixed glass hole.



Body (Interior and Exterior) > Bumper > front bumper > Components and Components Location

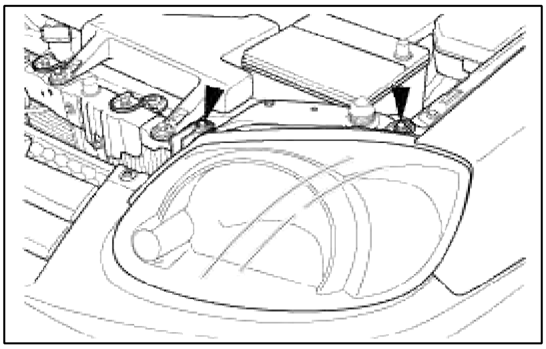
COMPONENTS


Side bracket
Energy absorber
Rail
Upper bracket
Side bracket
Grille
Bumper cover
Fog lamp

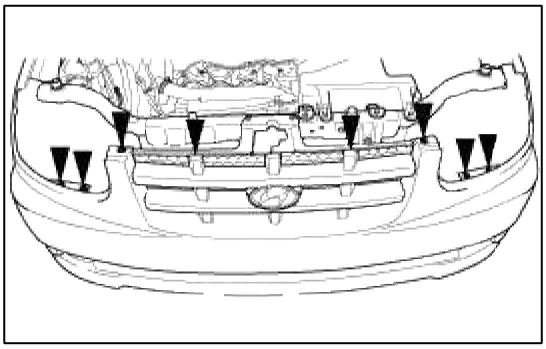
Body (Interior and Exterior) > Bumper > front bumper > Repair procedures

REMOVAL AND INSTALLATION

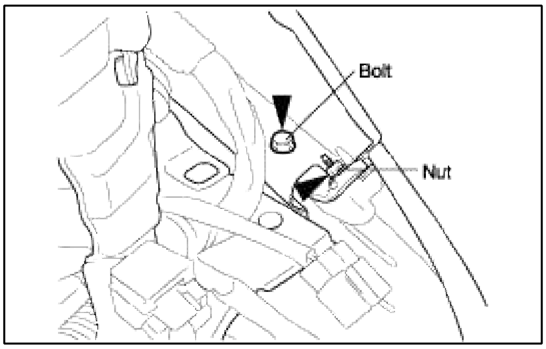
1. Loosen the head lamps, disconnect all connectors, and remove the head lamp.



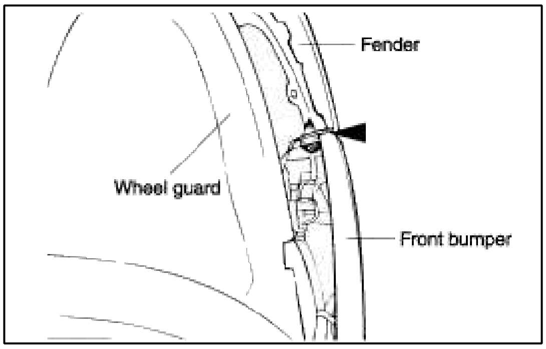
2. Remove the 6 mounting clips on the upper bumper and 2 clips in the inner bumper.

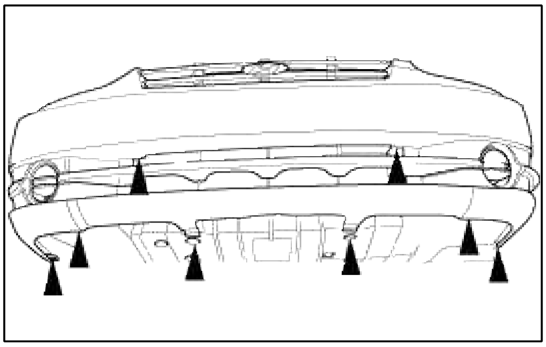


3. Remove the mounting bolt and nut in the bumper side.

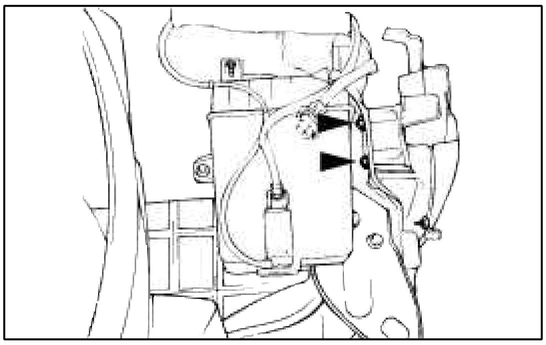


4. Raise the vehicle, remove the clip and screw from the lower member, and remove the bumper cover.


Fender
Wheel guard
Front bumper



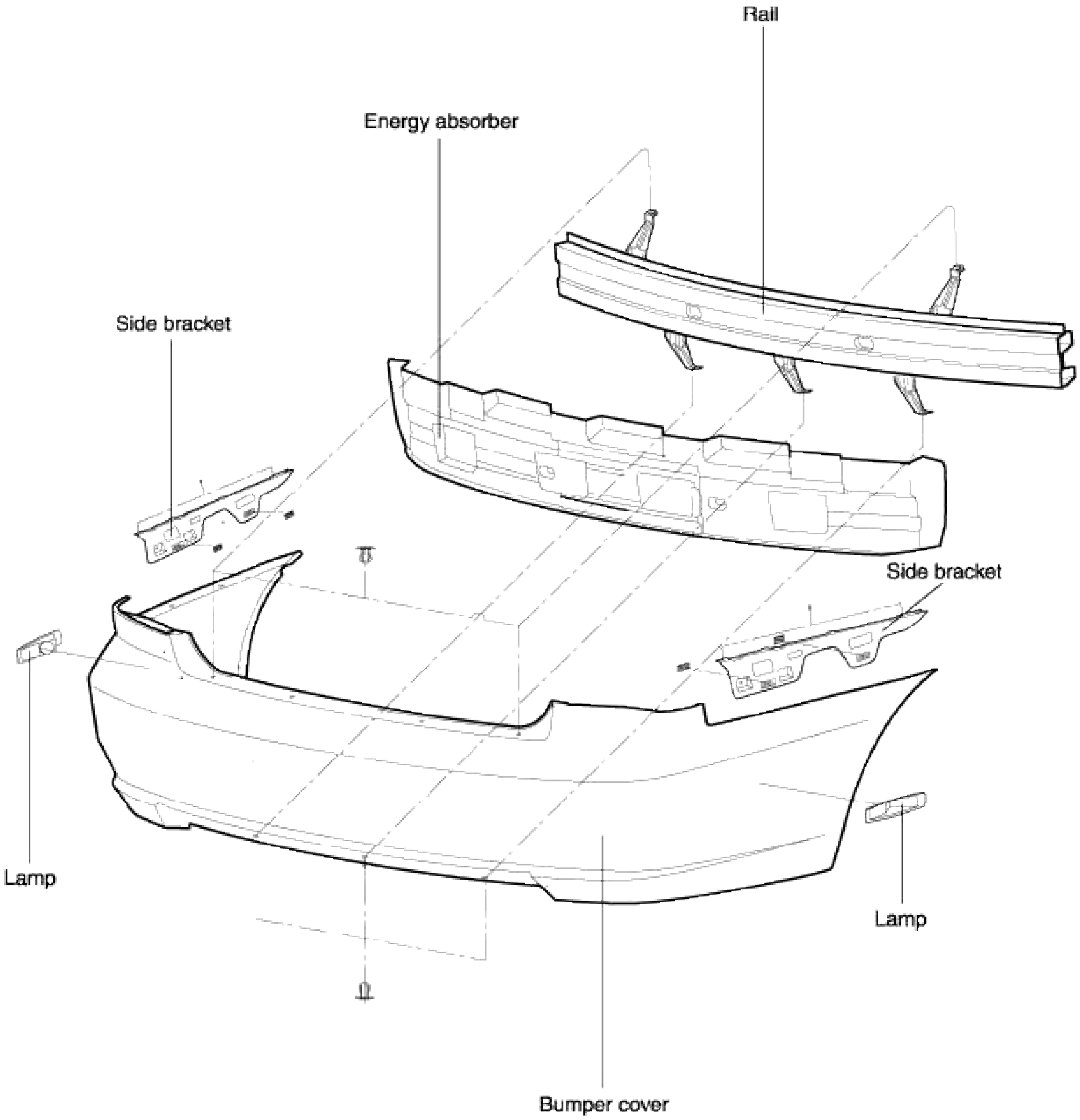
5. Remove the bumper stay.



6. Installation is the reverse of removal.

Body (Interior and Exterior) > Bumper > rear bumper > Components and Components Location

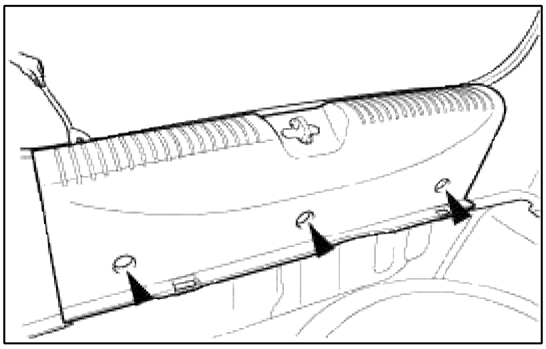
COMPONENTS

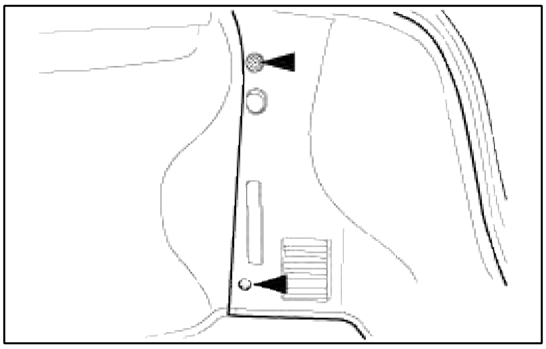

Rail
Energy absorber
Side bracket
Side bracket
Lamp
Lamp
Bumper cover

Body (Interior and Exterior) > Bumper > rear bumper > Repair procedures

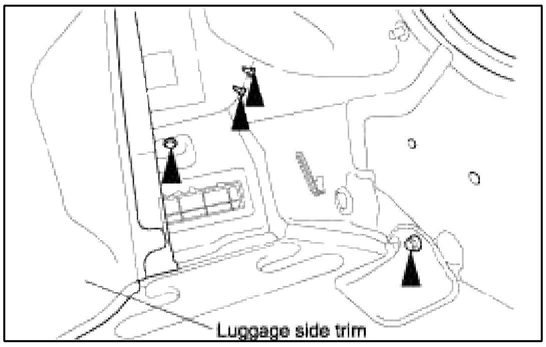
REMOVAL AND INSTALLATION

1. Remove the transverse trim and luggage rear trim.

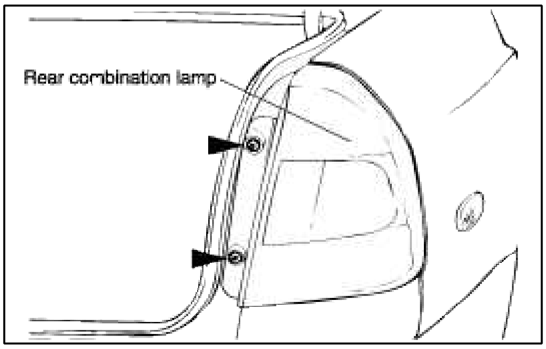




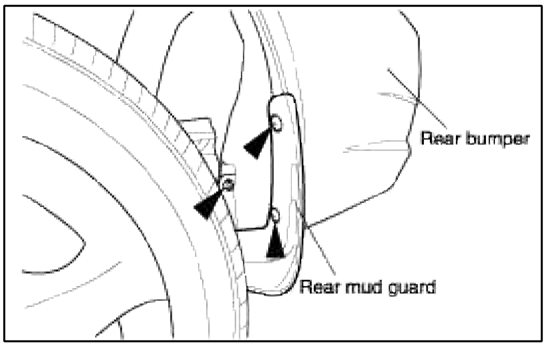
2. Loosen the 2 mounting bolts and 2 nuts from the luggage rear trim inner rear bumper cover.

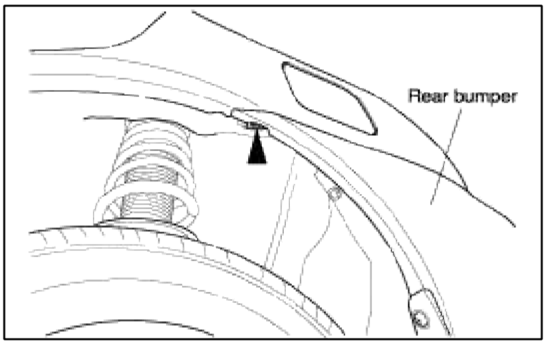

Luggage side trim

3. Remove the rear combination lamp.

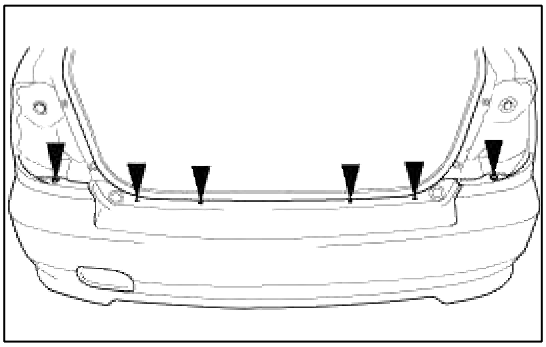

Rear combination lamp

4. Loosen the 3 mounting screws on the mud guard, remove the mud guard, and loosen the rear wheel house inner mounting screw.

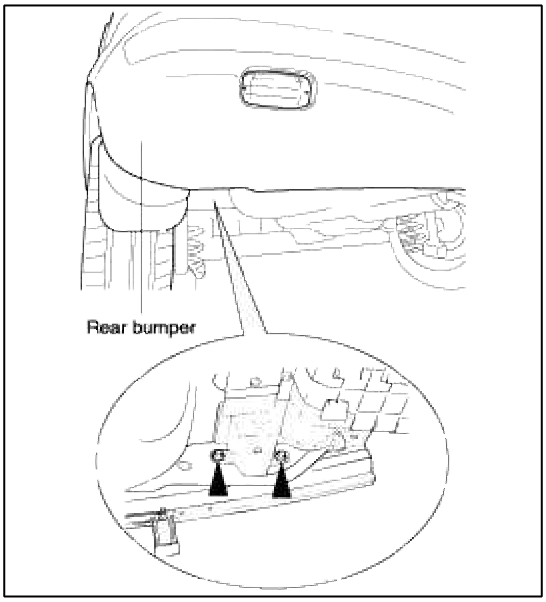

Rear bumper
Rear mud guard


Rear bumper

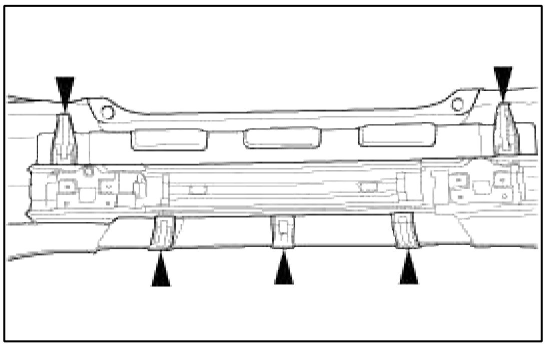
5. Loosen the 6 mounting screw on the upper rear bumper cover.



6. After loosening the rear bumper cover inner rail mounting bolts (Left : 2, Right : 2), remove the rear bumper assembly.


Rear bumper

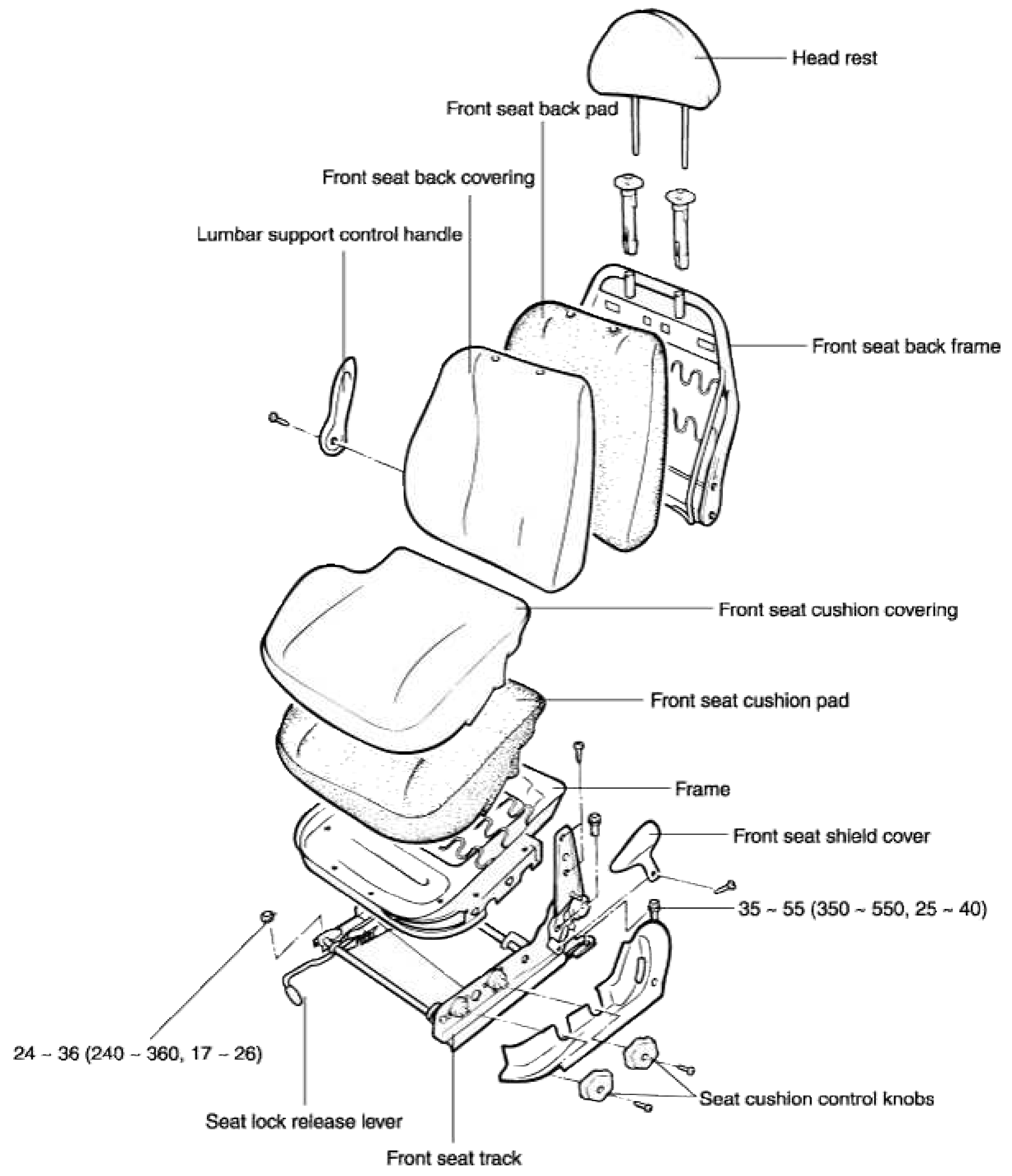
7. After loosening 5 mounting screw on the rear bumper cover, disconnect the cover from the rail.



8. Installation is the reverse of removal.

Body (Interior and Exterior) > Seat & Power Seat > front seat > Components and Components Location

COMPONENTS


Head rest
Front seat back pad
Front seat back covering
Lumbar support control handle
Front seat back frame
Front seat cushion covering
Front seat cushion pad
Frame
Front seat shield cover
35 ~ 55 (350 ~ 550, 25 ~ 40)
24 ~ 36 (240 ~ 360, 17 ~ 26)
Seat cushion control knobs
Seat lock release lever
Front seat track

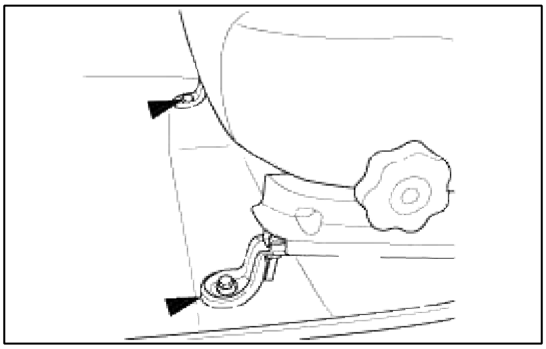
TORQUE : Nm (kg·cm, lb·ft)

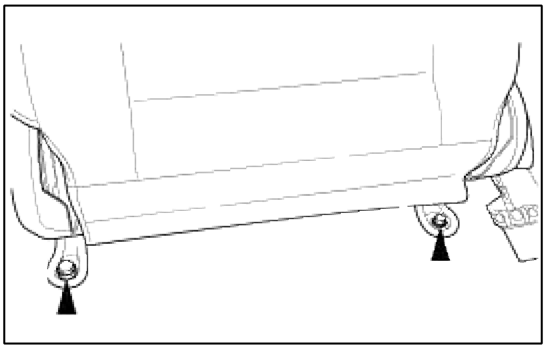
Body (Interior and Exterior) > Seat & Power Seat > front seat > Repair procedures

REMOVAL AND INSTALLATION

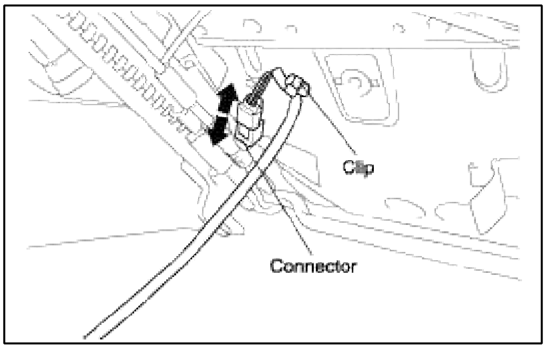
1. Loosen 4 mounting bolts on the front seat.

TORQUE: 35 ~ 55 Nm (350 ~ 550 kg·cm,25 ~ 40 lb·ft)





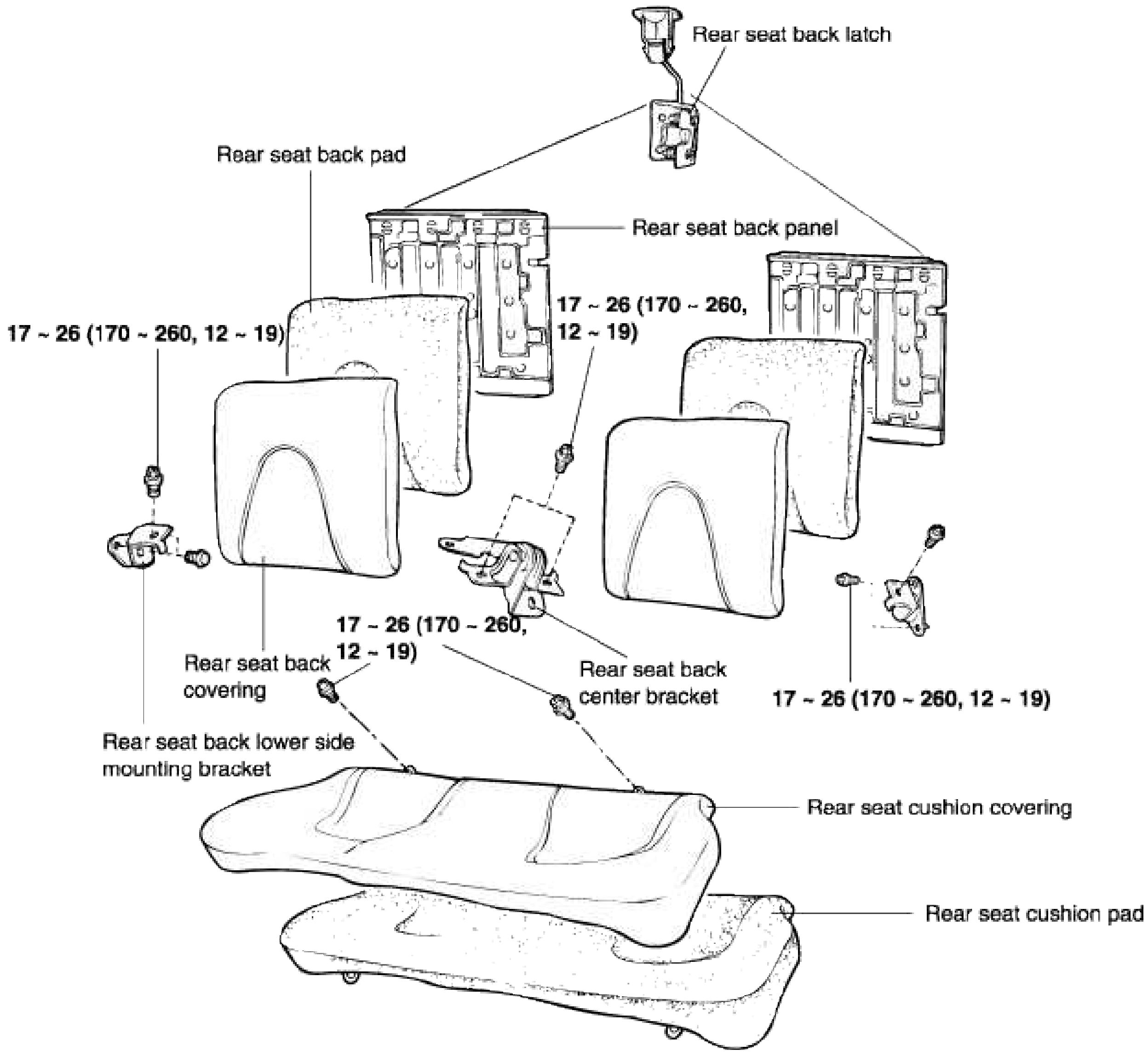
2. Disconnect the airbag connector and remove the front seat.



3. Installation is the reverse of removal.

Body (Interior and Exterior) > Seat & Power Seat > rear seat > Components and Components Location

COMPONENTS

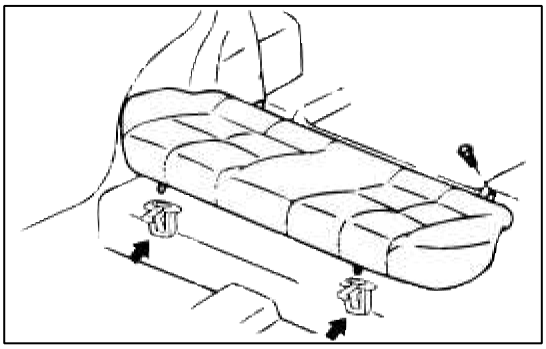

Rear seat back latch
Rear seat back pad
Rear seat back panel
17 ~ 26 (170 ~ 260, 12 ~ 19)
17 ~ 26 (170 ~ 260, 12 ~ 19)
17 ~ 26 (170 ~ 260, 12 ~ 19)
Rear seat back covering
Rear seat back center bracket
17 ~ 26 (170 ~ 260, 12 ~ 19)
Rear seat back lower side mounting bracket
Rear seat cushion covering
Rear seat cushion pad

TORQUE : Nm (kg·cm, lb·ft)

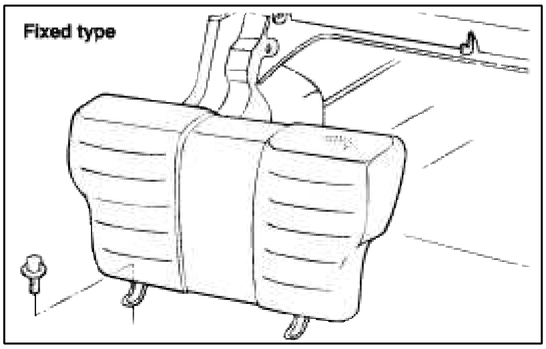
Body (Interior and Exterior) > Seat & Power Seat > rear seat > Repair procedures

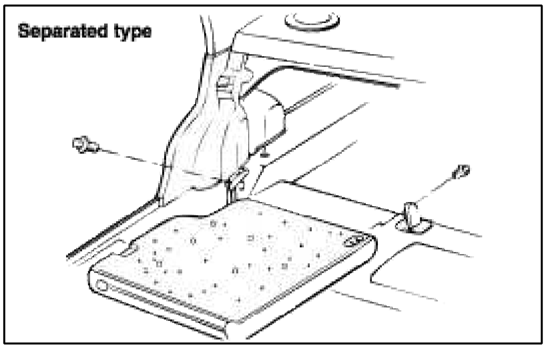
REMOVAL AND INSTALLATION

1. Loosen the rear seat cushion mounting bolts and remove the rear seat cushion.

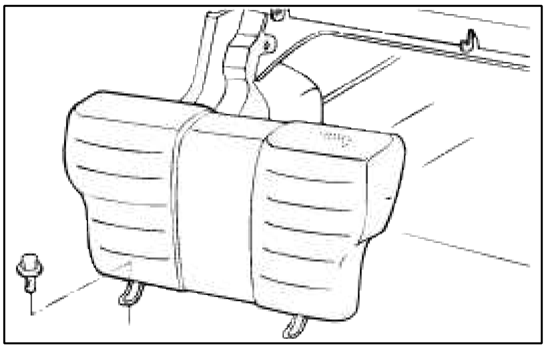


2. Loosen the rear seat mounting bolts and then remove the seat back (fixed type).
   Recline the rear split back forward and then loosen the mounting bracket.
   Remove the seat back (Separated type).





3. Installation is the reverse of removal. When installing the rear seat back, tighten the mounting bracket after inserting the hook on the bracket.



Body (Interior and Exterior) > Seat Belt > front seat belt > General Safety Information and Caution

PECAUTIONS

PRECAUTIONS FOR MECHANICAL PRETENSIONER SEAT BELT HANDLING

1. Do not reuse the pretensioner seat belt. It is available only one.
2. Do not grab the webbing when carrying out the pretensioner seat belt. It can damage the parts as well as injury hands seriously by unexpected deployment.
3. Do not disassemble or repair the pretensioner seat belt.

4. After assembling the mounting bolt temporarily, insert the webbing over 500mm to the retractor. (It can be deployed during installation).
5. After installation, when the webbing is drawn out over 2000mm(from the low anchor plate center to the retractor center), a little impact can cause deployment.
6. Do not install the pretensioner at over 40cm higher.
7. When handling more than one pretensioner, do not carry them by hand.

PRECAUTIONS FOR ELECTRICAL PRETENSIONER SEAT BELT HANDLING

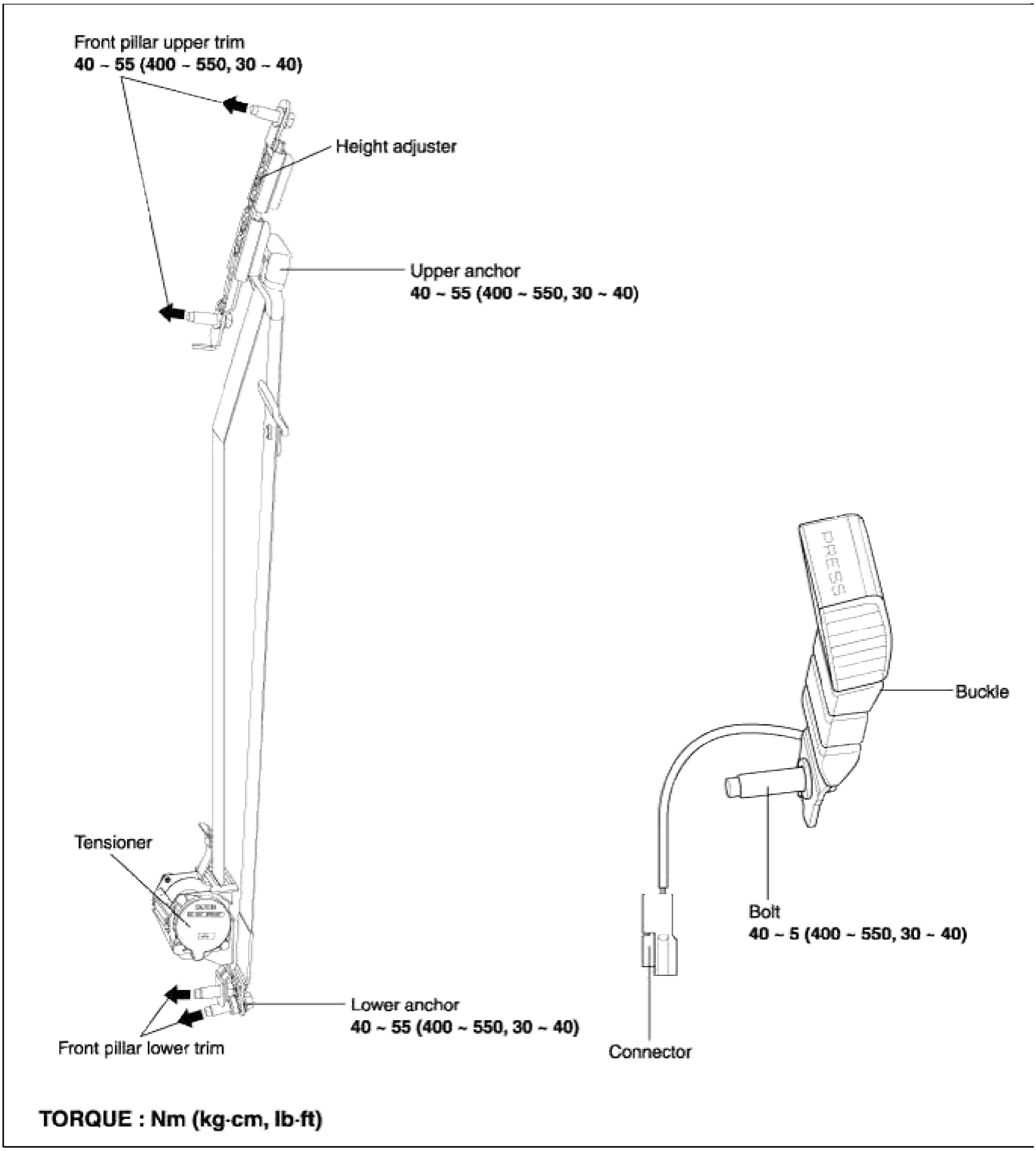
1. Do not reuse the pretensioner seat belt. It is available just one time.
2. Do not grab the webbing when carrying out the pretensioner seat belt. It can damage the parts as well as injury hands seriously by unexpected deployment.
3. Do not disassemble or repair the pretensioner seat belt.
4. After securely installing the pretensioner, connect the battery.
5. Removal procedure for the prtensioner
   A. Check that the power is turned off and the ignition key is at "STOP".
   B. Disconnect the (-) negative battery terminal.
   C. Wait about one minute.
   D. After disconnecting the gas generator, loosen the mounting bolt and disconnect the pretensioner.
6. Installation is the reverse of removal.

Body (Interior and Exterior) > Seat Belt > front seat belt > Repair procedures

REMOVAL AND INSTALLATION

> **NOTE**
>
> When using a screwdriver or a trim remover, wrap it with protective tape to prevent damage.

1. First, remove the following items.
   A. Front door scuff trim
   B. Rear door scuff trim
   C. Center pillar lower trim
   D. Center pillar upper trim
2. Remove the front seat belt.
3. Installation is the reverse of removal.


Front pillar upper trim
40 ~ 55 (400 ~ 550, 30 ~ 40)
Height adjuster
Upper anchor
40 ~ 55 (400 ~ 550, 30 ~ 40)
PRESS
Buckle
Tensioner
Bolt
40 ~ 5 (400 ~ 550, 30 ~ 40)
Lower anchor
40 ~ 55 (400 ~ 550, 30 ~ 40)
Front pillar lower trim
Connector
TORQUE : Nm (kg-cm, lb-ft)

Body (Interior and Exterior) > Seat Belt > rear seat belt > Repair procedures

REMOVAL AND INSTALLATION

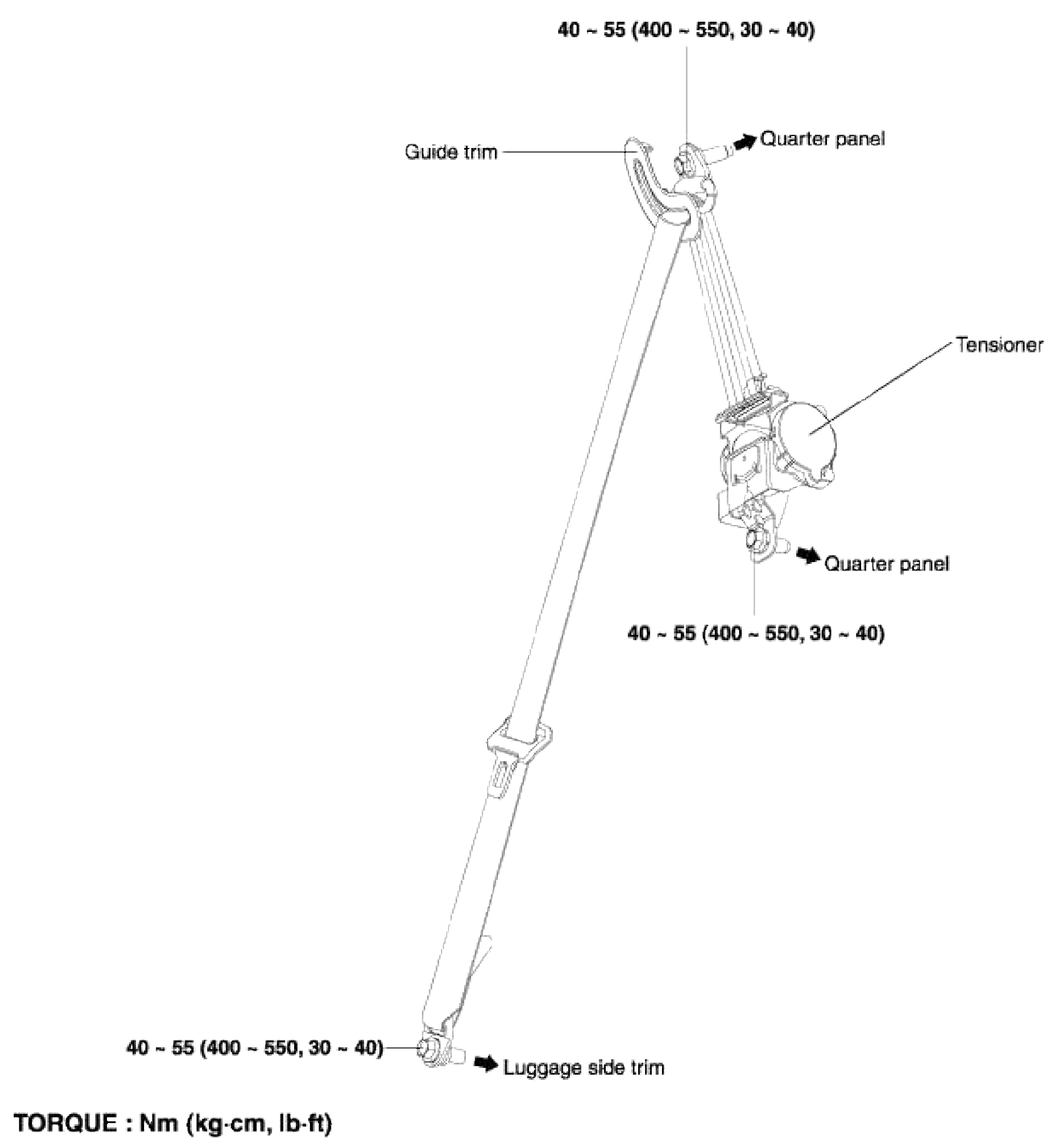
REAR SEAT BELT

NOTE

When using a screwdriver or a trim remover, wrap it with protective tape to prevent damage.

1. First, remove the following items.
   A. Transverse trim
   B. Luggage side trim
   C. Rear pillar trim
2. Remove the rear seat belt.

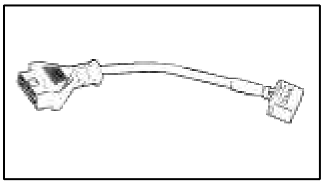
3. Installation is the reverse of removal.


40 ~ 55 (400 ~ 550, 30 ~ 40)
Guide trim
Quarter panel
Tensioner
Quarter panel
40 ~ 55 (400 ~ 550, 30 ~ 40)
40 ~ 55 (400 ~ 550, 30 ~ 40)
Luggage side trim
TORQUE : Nm (kg-cm, lb-ft)

ACCENT(LC) > 2002 > G 1.5 SOHC > Body Electrical System

Body Electrical System > General Information > Special Service Tools

SPECIAL TOOLS

Tool (Number and Name)	Illustration	Use
09900-21300 Keyless adapter		Store transmitter code connecting the DLC (Data Link Connector) cable of Hi-scan to the multi purpose check connector.

Body Electrical System > General Information > Troubleshooting

TROUBLESHOOTING

INSTRUMENTS AND WARNING SYSTEM

Symptom	Possible cause	Remedy
Tachometer does not operate	No.2 fuse (10A) blown Tachometer faulty Wiring faulty	Check for short and replace fuse Check tachometer Repair if necessary
Fuel gauge does not operate	No.2 fuse (10A) blown Fuel gauge faulty Fuel sender faulty Wiring faulty	Check for short and replace fuse Check gauge Check fuel sender Repair if necessary
Low fuel warning lamp does not light	No.2 fuse (10A) blown Bulb burned out Fuel level sensor faulty Wiring or ground faulty	Check for short and replace fuse Replace bulb Check sensor Repair if necessary
Water temperature gauge does not operate	No.2 fuse (10A) blown Water temperature gauge faulty Water temperature sender faulty Wiring or ground faulty	Check for short and replace fuse Check gauge Check sender Repair if necessary
Oil pressure warning lamp does not light	No.2 fuse (10A) blown Bulb burned out Oil pressure switch faulty Wiring or ground faulty	Check for short and replace fuse Replace bulb Check switch Repair if necessary
Low brake fluid warning lamp does not light	No.2 fuse (10A) blown Bulb burned out Brake fluid level warning switch faulty Parking brake switch faulty	Check for short and replace fuse Replace bulb Check switch Check switch

	Wiring or ground faulty	Repair if necessary
Open door warning lamp does not light	Room lamp fuse (10A) blown Battery fusible link (50A) blown Bulb burned out Door switch faulty Wiring or ground faulty	Check for short and replace fuse Replace the fusible link Replace bulb Check switch Repair if necessary
Seat belt warning lamp does not light	No.2 fuse (10A) blown Bulb burned out Buckle switch faulty Wiring or gound faulty	Check for short and replace fuse Replace bulb Check switch Repair if necessary

LIGHTING SYSTEM

Symptom	Possible cause	Remedy
One lamp does not light (all exterior)	Bulb burned out Socket, wiring or ground faulty	Replace bulb Repair if necessary
Head lamps do not light	Bulb burned out No.10 fuse (10A) blown Fusible link (50A) blown Head lamp relay faulty Lighting switch faulty Wiring or ground faulty	Replace bulb Check for short and replace fuse Replace the fusible link Check relay Check switch Repair if necessary
Tail lamps and license plate lamps do not light	Tail lamp fuse (10A) blown Battery fusible link (50A) blown Tail lamp relay faulty Lighting switch faulty Wiring or ground faulty	Replace fuse and check for short Replace the fusible link Check relay Check switch Repair if necessary
Stop lamps do not light	No.8 fuse (10A) blown Stop lamp switch faulty Wiring or ground faulty	Replace fuse and check for short Adjust or replace switch Repair if necessary
Stop lamps stay on	Stop lamp switch faulty	Adjust or replace switch
Instrument lamps do not light (Tail lamps light)	Rheostat faulty Wiring or ground faulty	Check rheostat Repair if necessary
Turn signal lamp does not flash on one side	Bulb burned out Turn signal switch faulty Wiring or ground faulty	Replace bulb Check switch Repair if necessary
Turn signal lamps do not operate	No.1 fuse (10A) blown Flasher unit faulty Turn signal switch faulty Wiring or ground faulty	Replace fuse and check for short Check flasher unit Check switch Repair if necessary
Hazard warning lamps do not operate	No.7 fuse (10A) blown	Replace fuse and check for

	Flasher unit faulty Hazard switch faulty Hazard relay faulty Wiring or ground faulty	short Check flasher unit Check switch Replace relay Repair if necessary
Flasher rate too slow or too fast	Lamps' wattages are smaller or larger than specified Defective flasher unit	Replace lamps Check flasher unit
Back up lamps do not light up	No.5 fuse (10A) blown Back up lamp switch faulty Wiring or ground faulty	Replace fuse and check for short Check switch Repair if necessary
Room lamp does not light up	Room lamp fuse (10A) blown Wiring or ground faulty	Replace fuse and check for short Repair if necessary

AUDIO

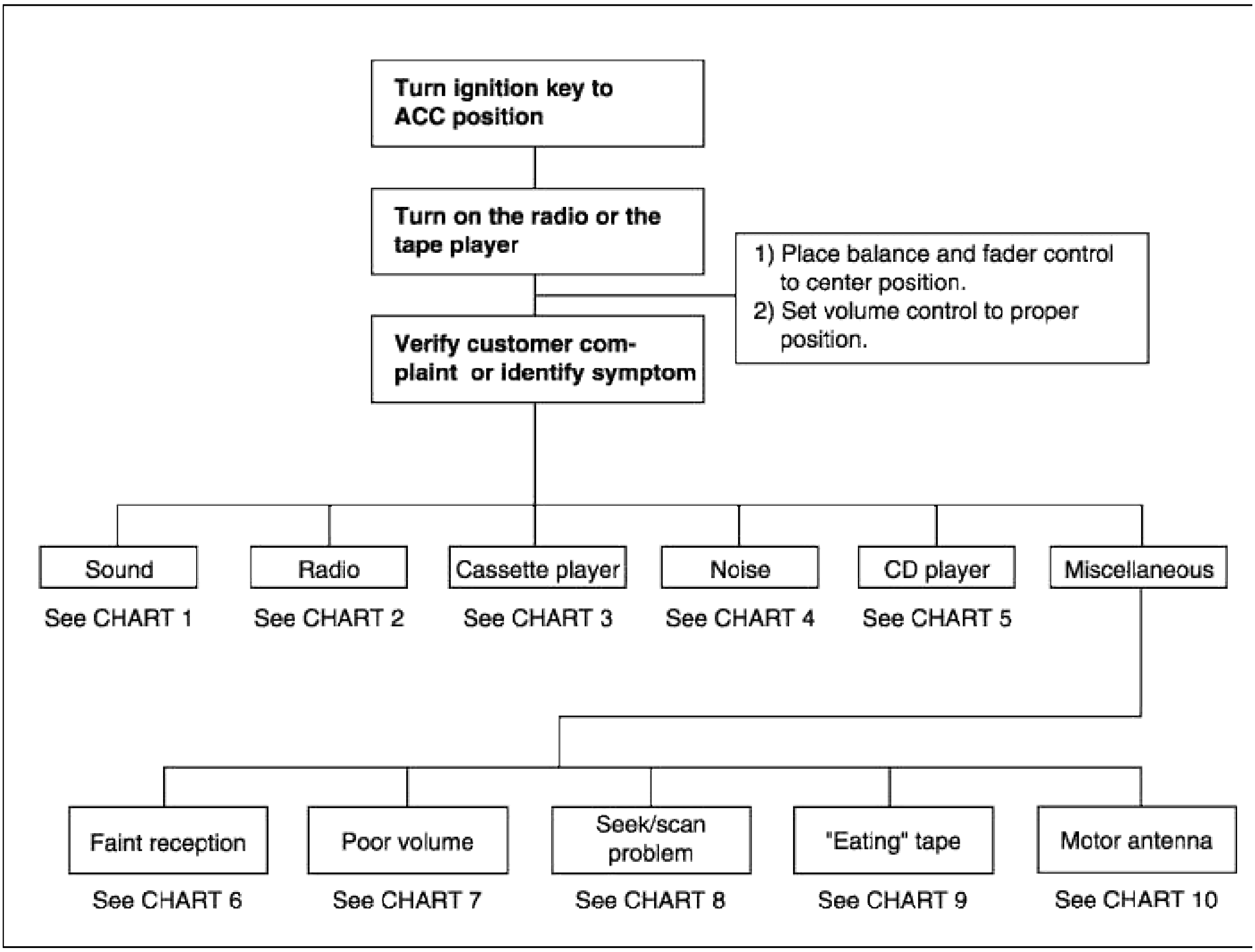
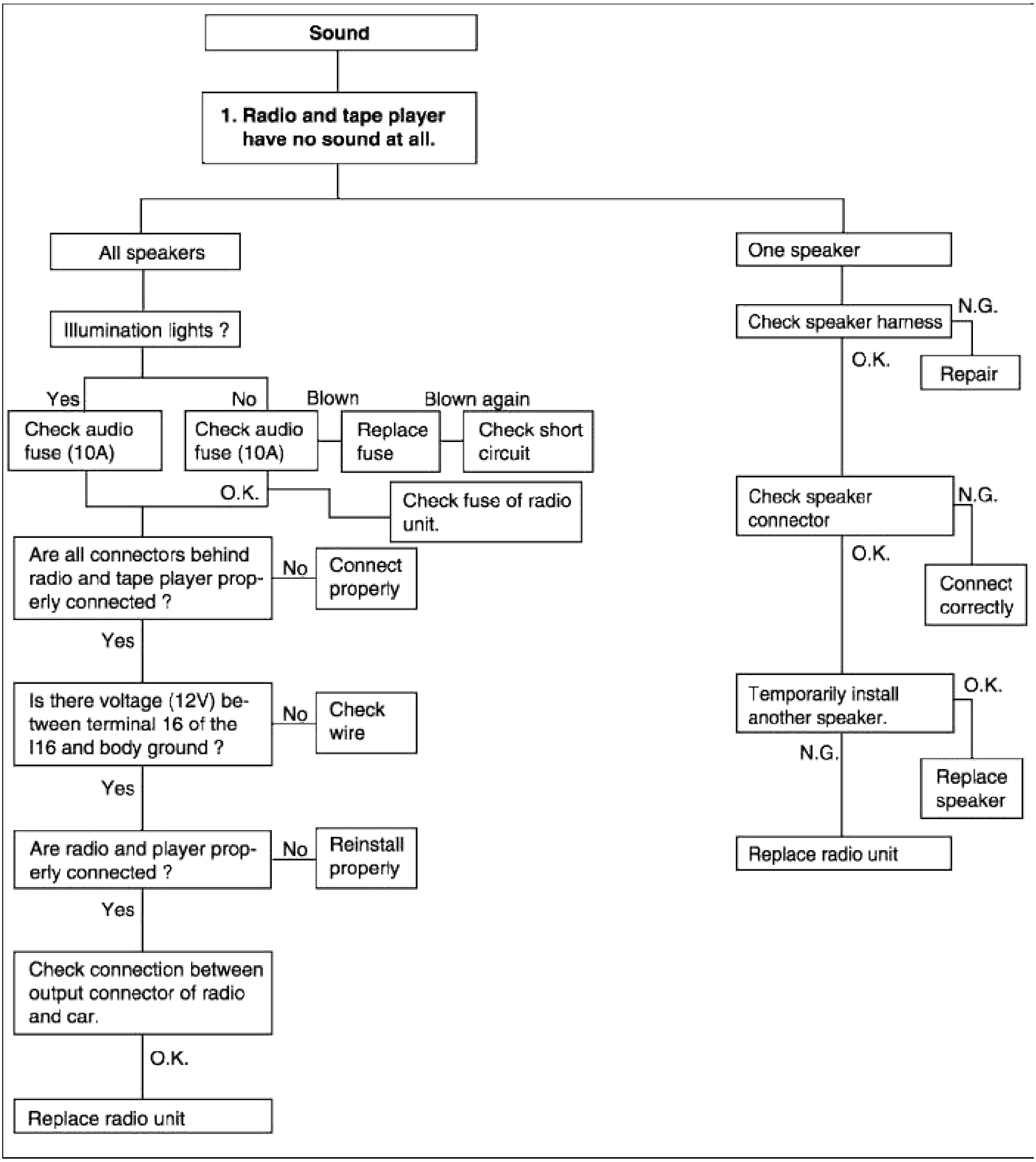

Turn ignition key to ACC position
Turn on the radio or the tape player
1) Place balance and fader control to center position.
2) Set volume control to proper position.
Verify customer complaint or identify symptom
Sound
See CHART 1
Radio
See CHART 2
Cassette player
See CHART 3
Noise
See CHART 4
CD player
See CHART 5
Miscellaneous
Faint reception
See CHART 6
Poor volume
See CHART 7
Seek/scan problem
See CHART 8
"Eating" tape
See CHART 9
Motor antenna
See CHART 10

CHART 1


Sound
1. Radio and tape player have no sound at all.
All speakers
Illumination lights ?
Yes
No
Check audio fuse (10A)
Check audio fuse (10A)
Blown
Replace fuse
Blown again
Check short circuit
O.K.
Check fuse of radio unit.
Are all connectors behind radio and tape player properly connected ?
No
Connect properly
Yes
Is there voltage (12V) between terminal 16 of the I16 and body ground ?
No
Check wire
Yes
Are radio and player properly connected ?
No
Reinstall properly
Yes
Check connection between output connector of radio and car.
O.K.
Replace radio unit
One speaker
Check speaker harness
N.G.
Repair
O.K.
Check speaker connector
N.G.
Connect correctly
O.K.
Temporarily install another speaker.
O.K.
Replace speaker
N.G.
Replace radio unit

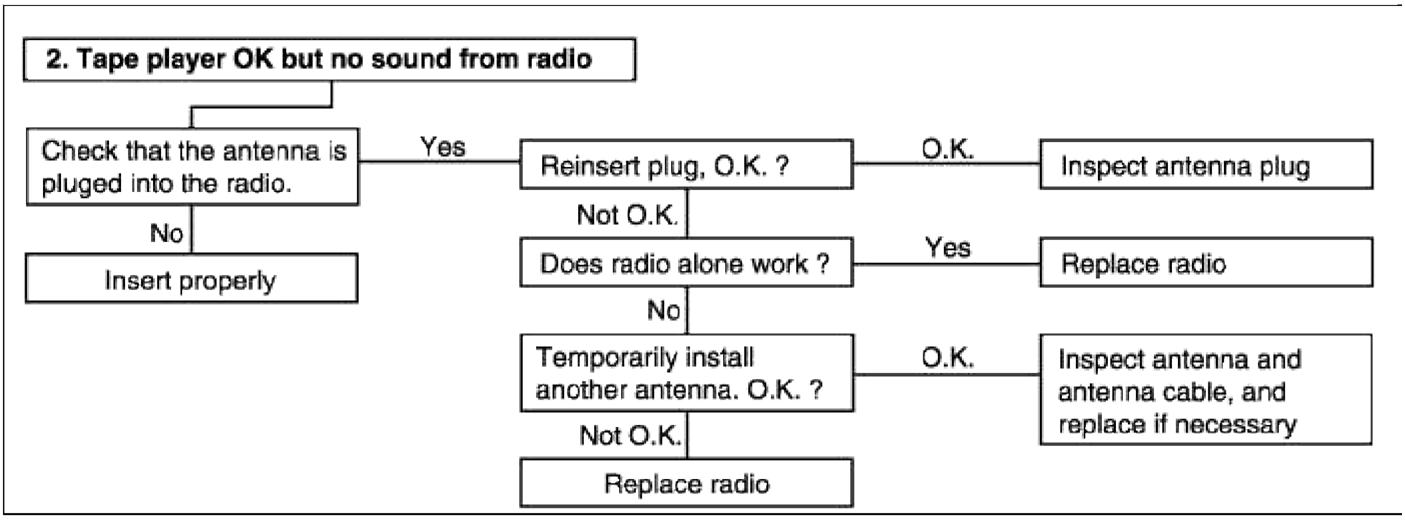

2. Tape player OK but no sound from radio
Check that the antenna is pluged into the radio.
Yes
Reinsert plug, O.K. ?
O.K.
Inspect antenna plug
Not O.K.
Does radio alone work ?
Yes
Replace radio
No
Temporarily install another antenna. O.K. ?
O.K.
Inspect antenna and antenna cable, and replace if necessary
Not O.K.
Replace radio
No
Insert properly

CHART 2

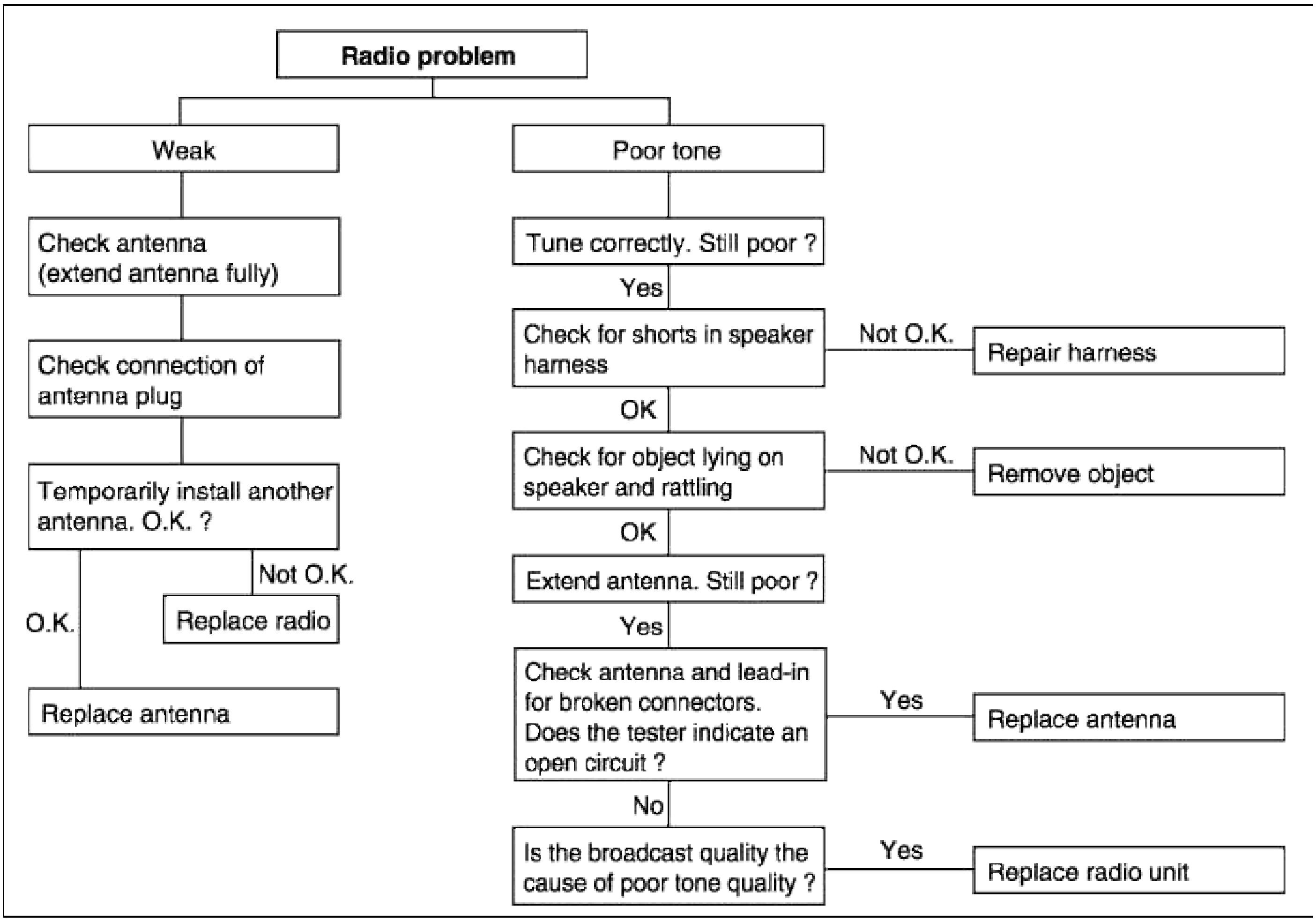

Radio problem
Weak
Check antenna (extend antenna fully)
Check connection of antenna plug
Temporarily install another antenna. O.K. ?
Not O.K.
Replace radio
O.K.
Replace antenna
Poor tone
Tune correctly. Still poor ?
Yes
Check for shorts in speaker harness
Not O.K.
Repair harness
OK
Check for object lying on speaker and rattling
Not O.K.
Remove object
OK
Extend antenna. Still poor ?
Yes
Check antenna and lead-in for broken connectors. Does the tester indicate an open circuit ?
Yes
Replace antenna
No
Is the broadcast quality the cause of poor tone quality ?
Yes
Replace radio unit

CHART 3

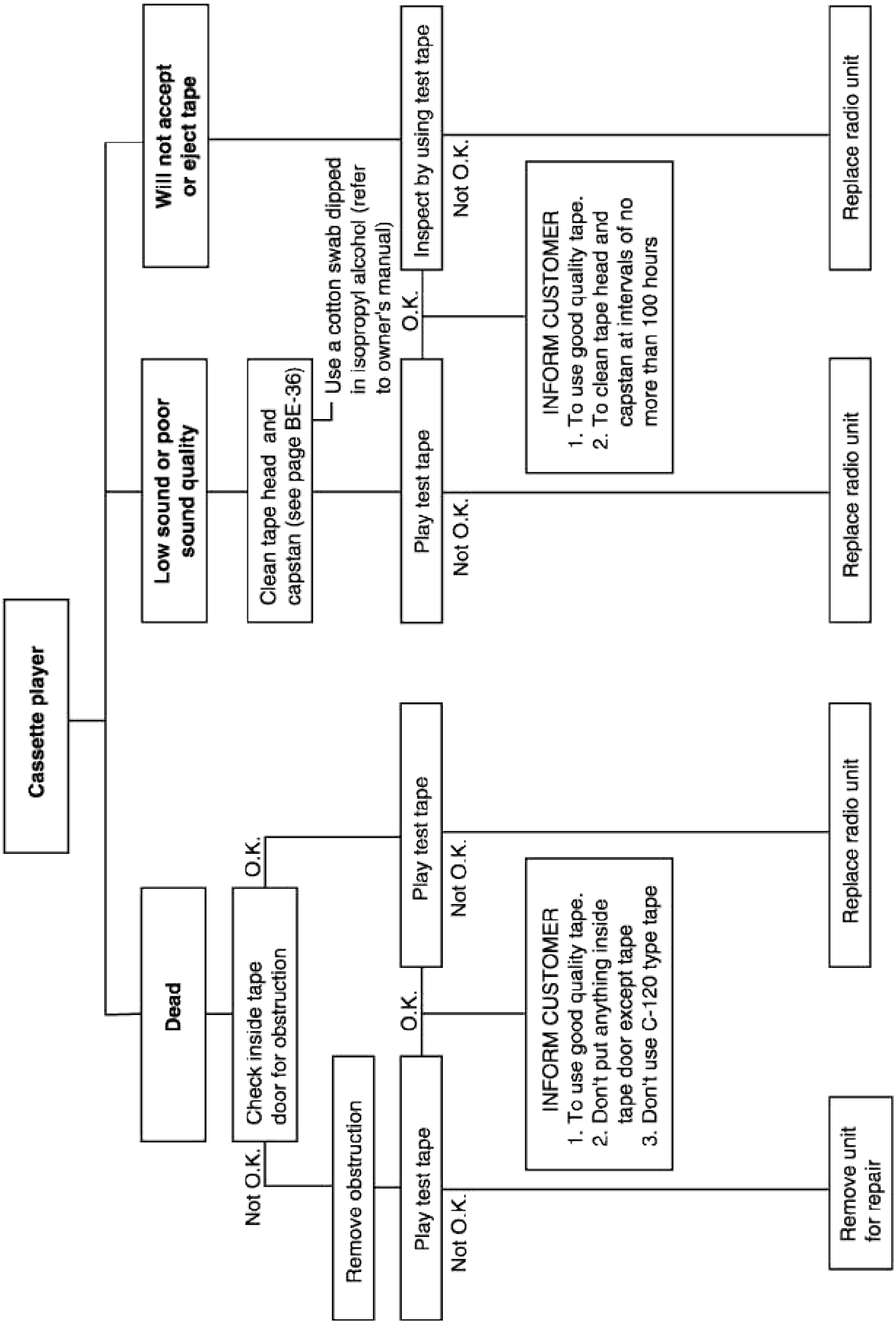
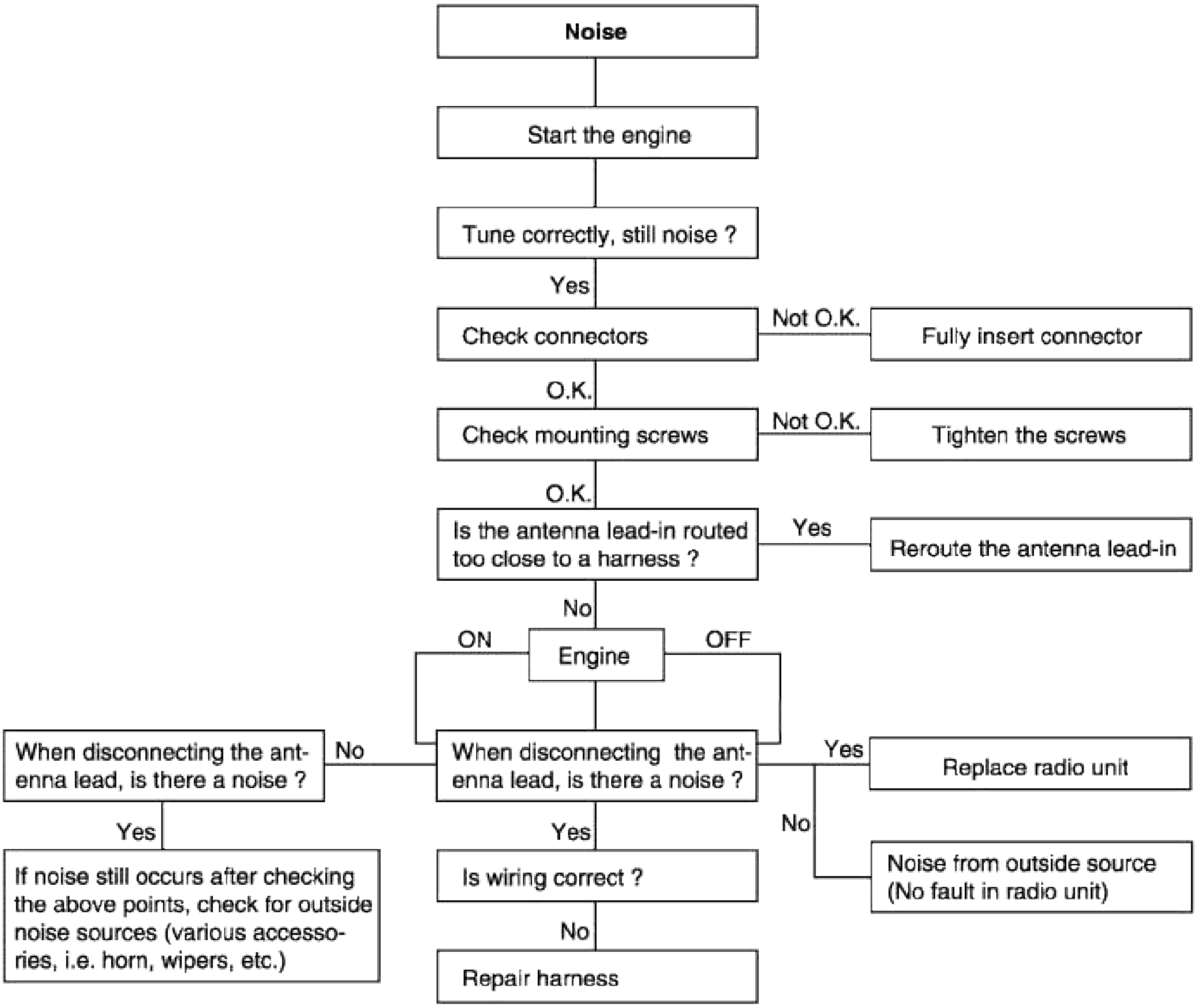

Cassette player
Dead
Check inside tape door for obstruction
O.K.
Not O.K.
Remove obstruction
Play test tape
O.K.
Not O.K.
Play test tape
Not O.K.
INFORM CUSTOMER
1. To use good quality tape.
2. Don't put anything inside tape door except tape
3. Don't use C-120 type tape
Replace radio unit
Remove unit for repair
Low sound or poor sound quality
Clean tape head and capstan (see page BE-36)
Use a cotton swab dipped in isopropyl alcohol (refer to owner's manual)
Play test tape
Not O.K.
O.K.
INFORM CUSTOMER
1. To use good quality tape.
2. To clean tape head and capstan at intervals of no more than 100 hours
Replace radio unit
Will not accept or eject tape
Inspect by using test tape
O.K.
Not O.K.
Replace radio unit

CHART 4

1. RADIO


Noise
Start the engine
Tune correctly, still noise ?
Yes
Check connectors
Not O.K.
Fully insert connector
O.K.
Check mounting screws
Not O.K.
Tighten the screws
O.K.
Is the antenna lead-in routed too close to a harness ?
Yes
Reroute the antenna lead-in
No
ON
Engine
OFF
When disconnecting the antenna lead, is there a noise ?
No
When disconnecting the antenna lead, is there a noise ?
Yes
Replace radio unit
No
Noise from outside source (No fault in radio unit)
Yes
If noise still occurs after checking the above points, check for outside noise sources (various accessories, i.e. horn, wipers, etc.)
Yes
Is wiring correct ?
No
Repair harness

2. TAPE

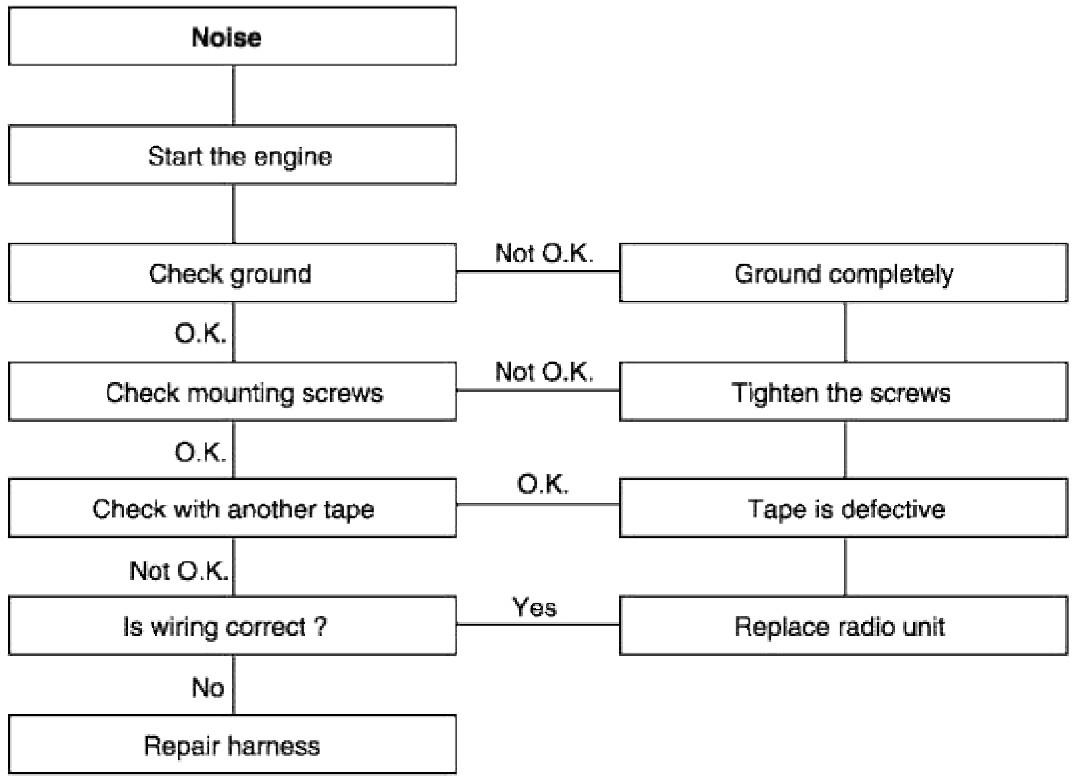
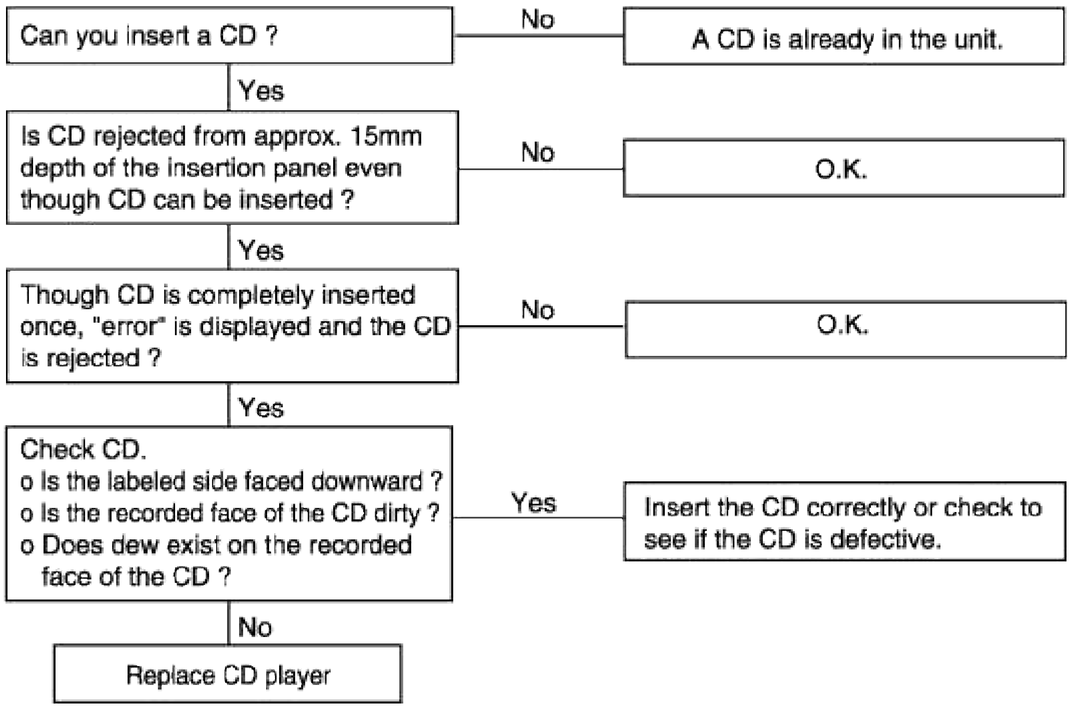
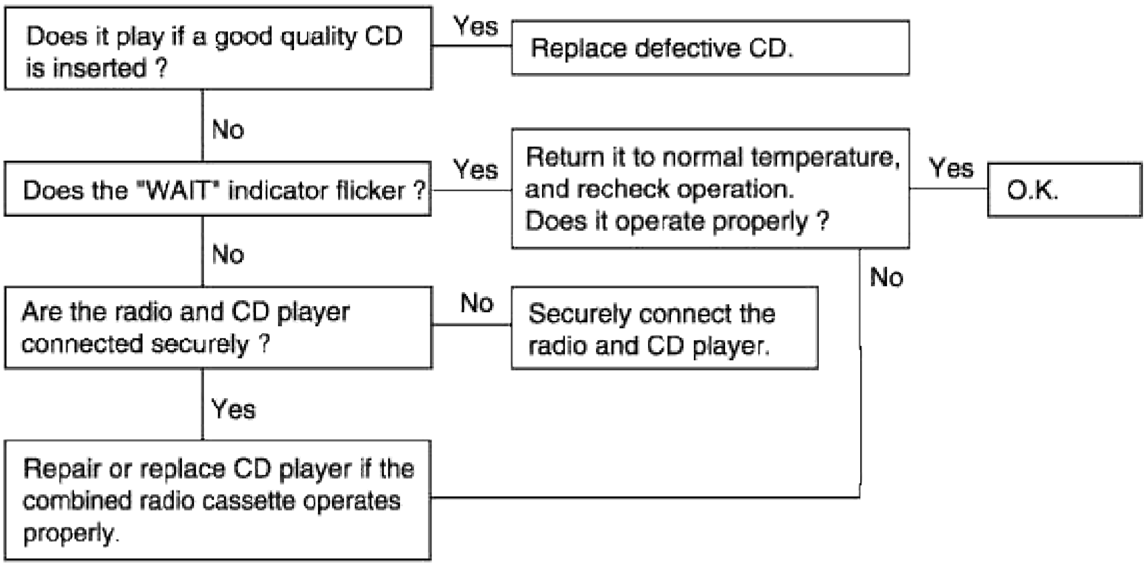

Noise
Start the engine
Check ground
Not O.K.
Ground completely
O.K.
Check mounting screws
Not O.K.
Tighten the screws
O.K.
Check with another tape
O.K.
Tape is defective
Not O.K.
Is wiring correct ?
Yes
Replace radio unit
No
Repair harness

CHART 5

1. CD WILL NOT BE ACCEPTED

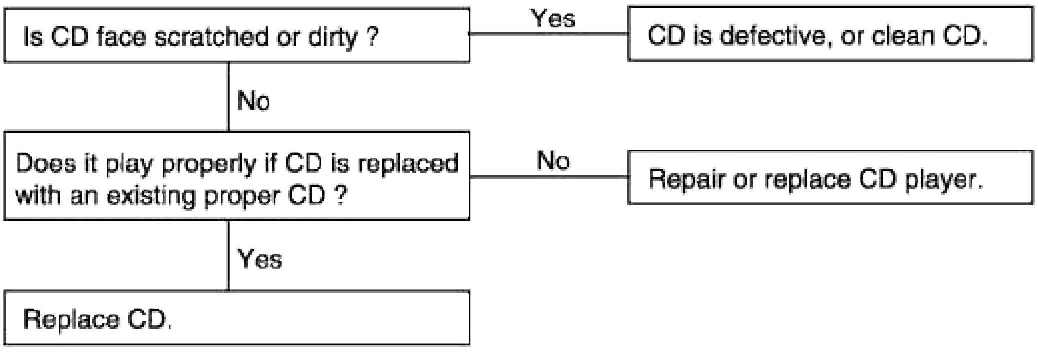

Can you insert a CD ?
No
A CD is already in the unit.
Yes
Is CD rejected from approx. 15mm depth of the insertion panel even though CD can be inserted ?
No
O.K.
Yes
Though CD is completely inserted once, "error" is displayed and the CD is rejected ?
No
O.K.
Yes
Check CD.
o Is the labeled side faced downward ?
o Is the recorded face of the CD dirty ?
o Does dew exist on the recorded face of the CD ?
Yes
Insert the CD correctly or check to see if the CD is defective.
No
Replace CD player

2. NO SOUND

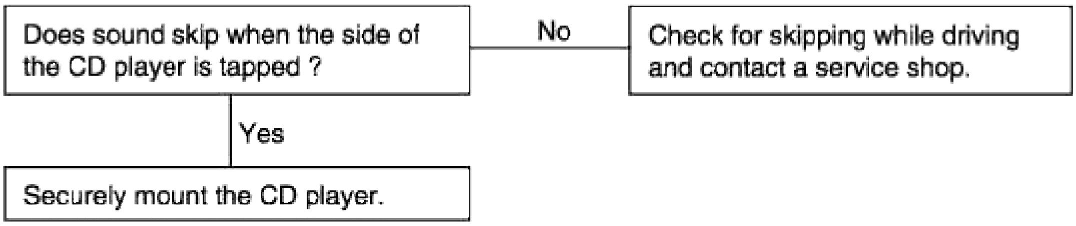

Does it play if a good quality CD is inserted ?
Yes
Replace defective CD.
No
Does the "WAIT" indicator flicker ?
Yes
Return it to normal temperature, and recheck operation. Does it operate properly ?
Yes
O.K.
No
No
Are the radio and CD player connected securely ?
No
Securely connect the radio and CD player.
Yes
Repair or replace CD player if the combined radio cassette operates properly.

3. CD SOUND SKIPS

1) Sound sometimes skips when parking.


Is CD face scratched or dirty ?
Yes
CD is defective, or clean CD.
No
Does it play properly if CD is replaced with an existing proper CD ?
No
Repair or replace CD player.
Yes
Replace CD.

2) Sound sometimes skips when driving.
(Stop vehicle, and check it.)
(Check by using a CD which is free of scratches, dirt or other damage.)


Does sound skip when the side of the CD player is tapped ?
No
Check for skipping while driving and contact a service shop.
Yes
Securely mount the CD player.

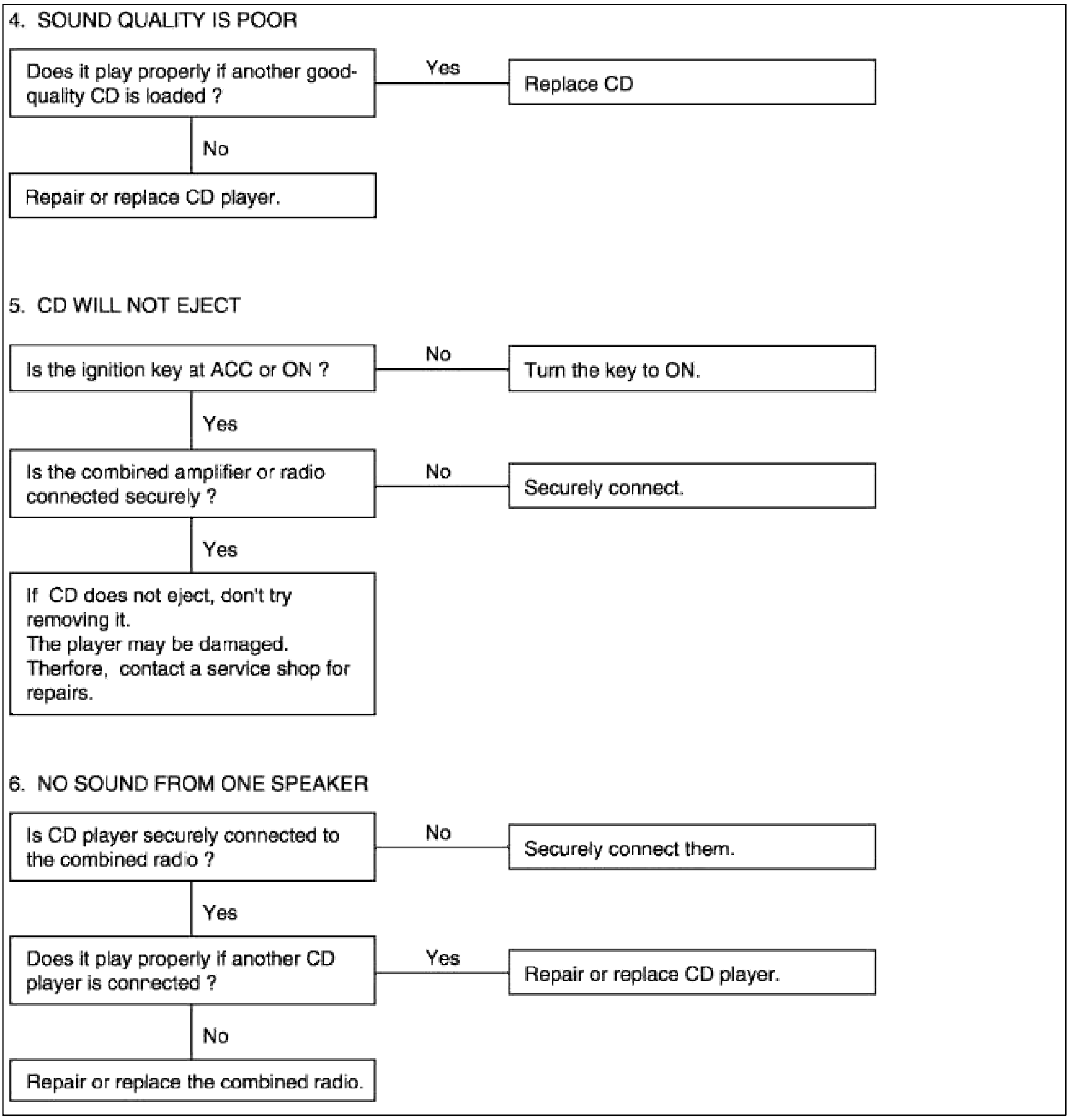

4. SOUND QUALITY IS POOR
Does it play properly if another good-quality CD is loaded ?
Yes
Replace CD
No
Repair or replace CD player.
5. CD WILL NOT EJECT
Is the ignition key at ACC or ON ?
No
Turn the key to ON.
Yes
Is the combined amplifier or radio connected securely ?
No
Securely connect.
Yes
If CD does not eject, don't try removing it. The player may be damaged. Therfore, contact a service shop for repairs.
6. NO SOUND FROM ONE SPEAKER
Is CD player securely connected to the combined radio ?
No
Securely connect them.
Yes
Does it play properly if another CD player is connected ?
Yes
Repair or replace CD player.
No
Repair or replace the combined radio.

CHART 6

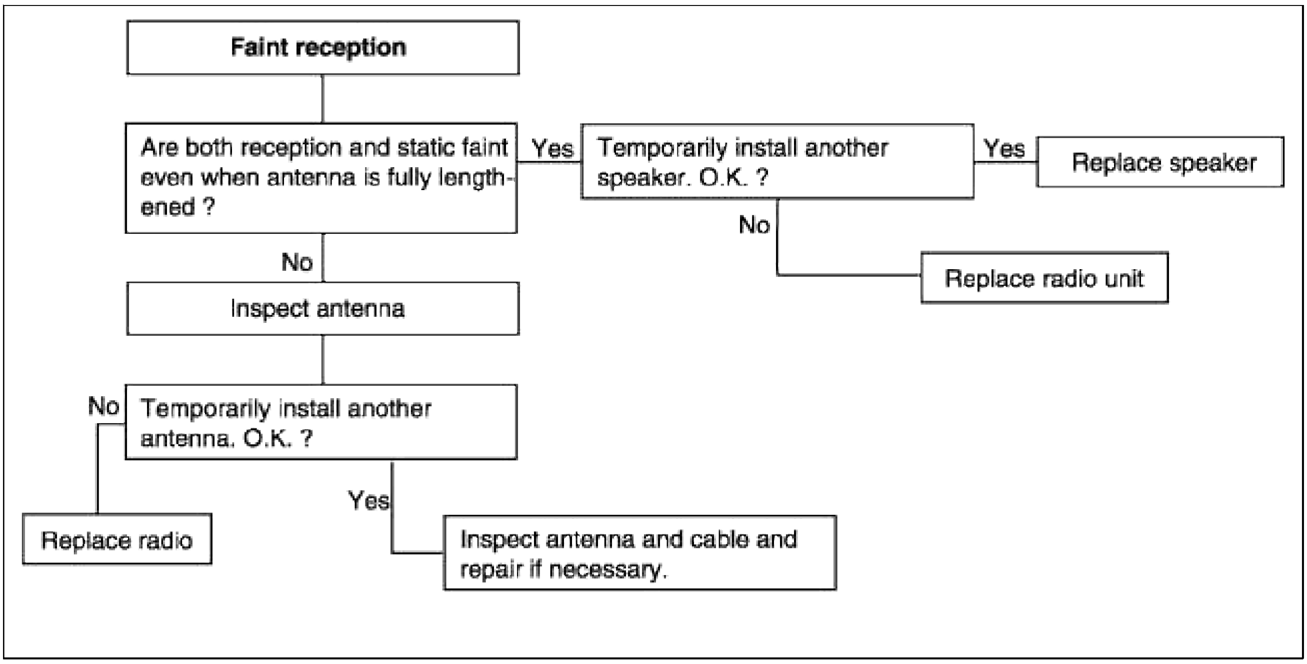

Faint reception
Are both reception and static faint even when antenna is fully lengthened ?
Yes
Temporarily install another speaker. O.K. ?
Yes
Replace speaker
No
Replace radio unit
No
Inspect antenna
No
Temporarily install another antenna. O.K. ?
Replace radio
Yes
Inspect antenna and cable and repair if necessary.

CHART 7

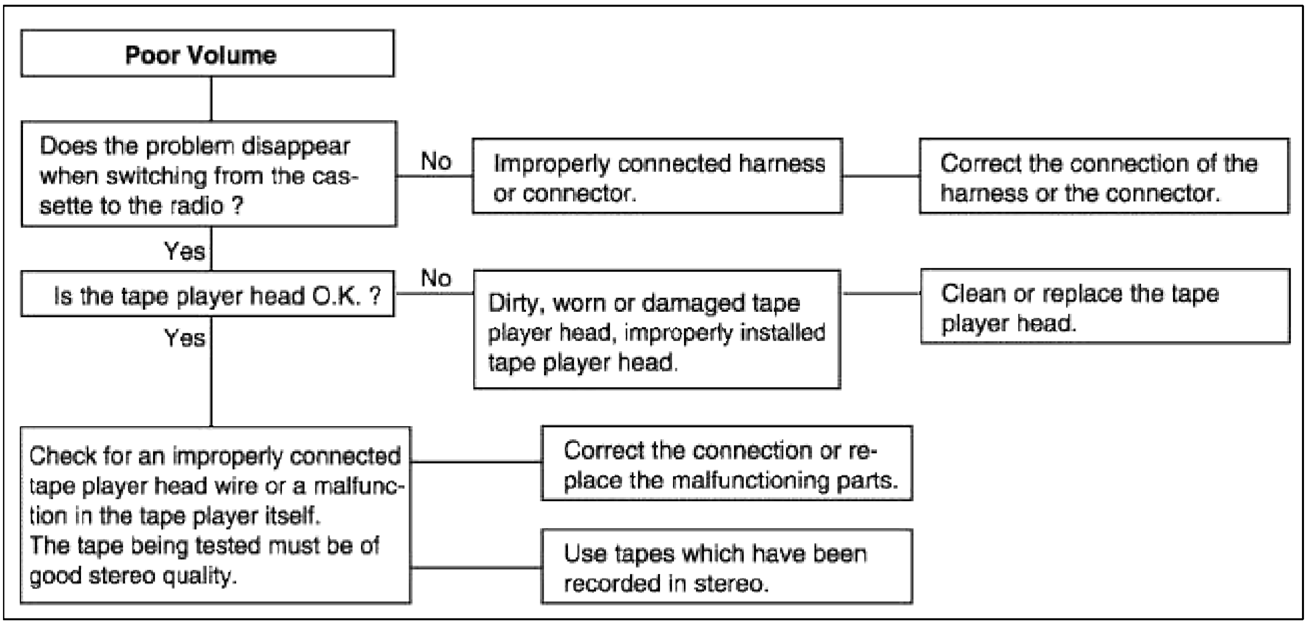

Poor Volume
Does the problem disappear when switching from the cassette to the radio ?
No
Improperly connected harness or connector.
Correct the connection of the harness or the connector.
Yes
Is the tape player head O.K. ?
No
Dirty, worn or damaged tape player head, improperly installed tape player head.
Clean or replace the tape player head.
Yes
Check for an improperly connected tape player head wire or a malfunction in the tape player itself.
The tape being tested must be of good stereo quality.
Correct the connection or replace the malfunctioning parts.
Use tapes which have been recorded in stereo.

CHART 8

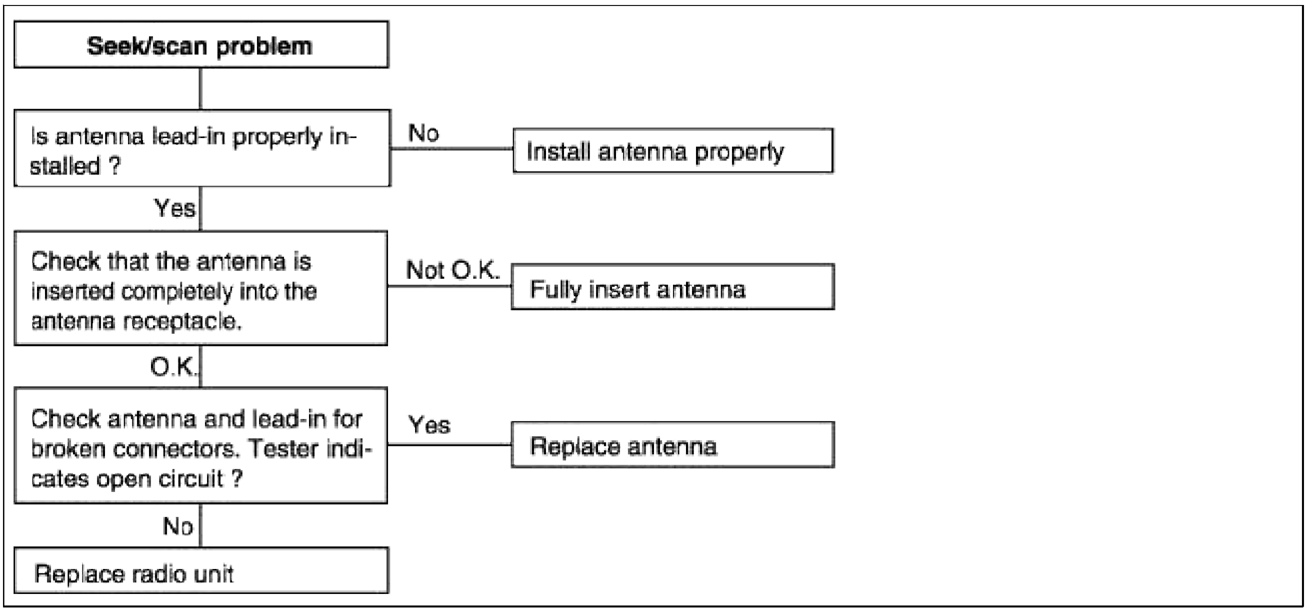

Seek/scan problem
Is antenna lead-in properly installed ?
No
Install antenna properly
Yes
Check that the antenna is inserted completely into the antenna receptacle.
Not O.K.
Fully insert antenna
O.K.
Check antenna and lead-in for broken connectors. Tester indicates open circuit ?
Yes
Replace antenna
No
Replace radio unit

CHART 9

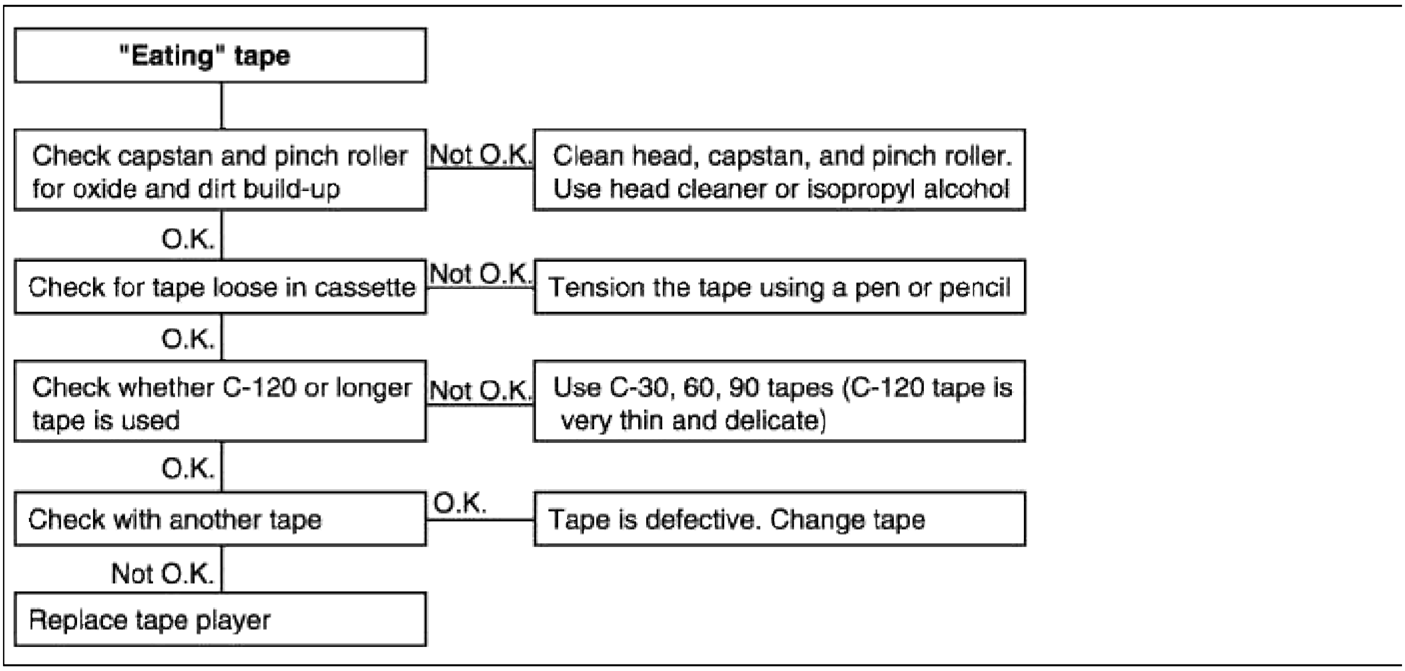
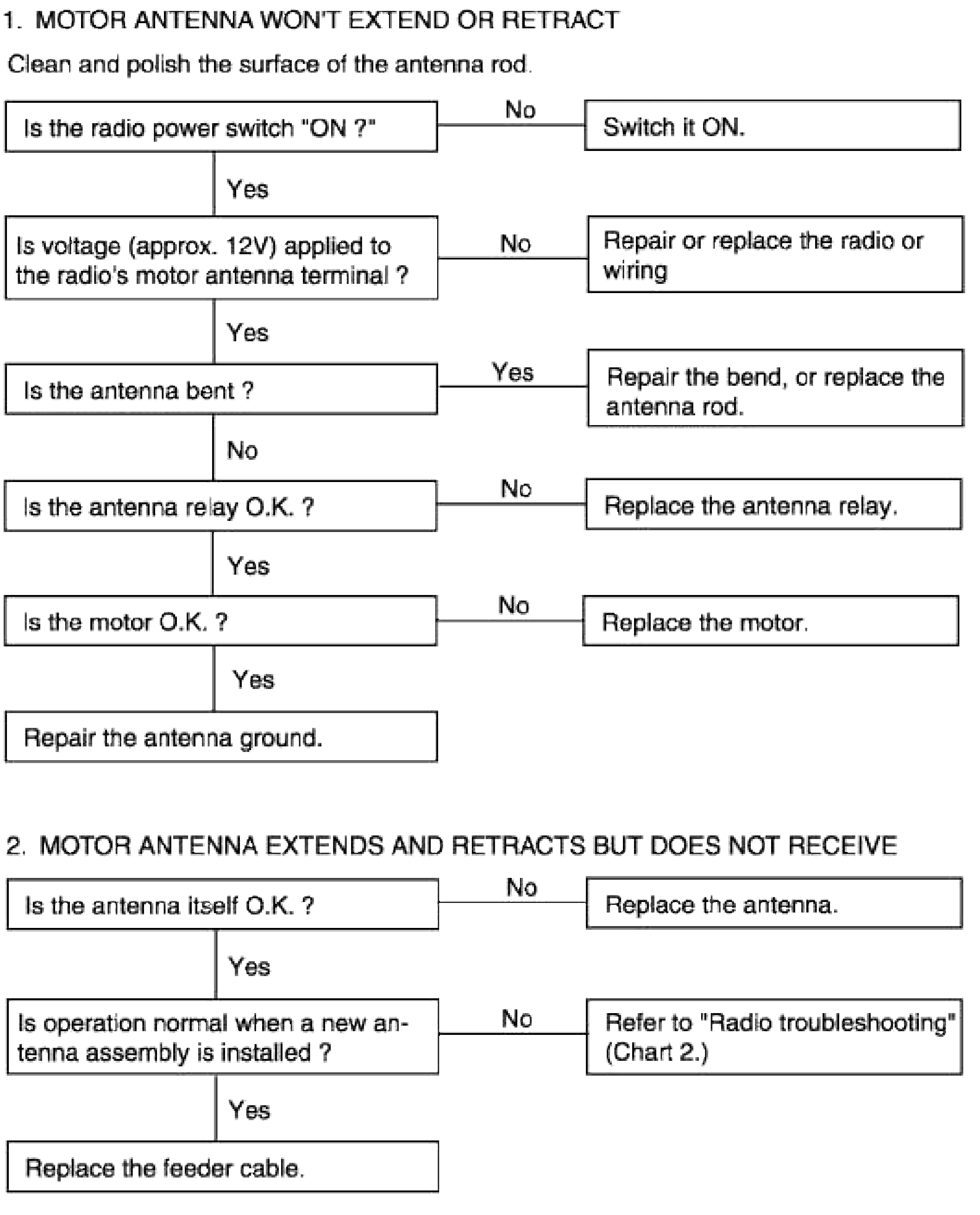

"Eating" tape
Check capstan and pinch roller for oxide and dirt build-up
Not O.K.
Clean head, capstan, and pinch roller. Use head cleaner or isopropyl alcohol
O.K.
Check for tape loose in cassette
Not O.K.
Tension the tape using a pen or pencil
O.K.
Check whether C-120 or longer tape is used
Not O.K.
Use C-30, 60, 90 tapes (C-120 tape is very thin and delicate)
O.K.
Check with another tape
O.K.
Tape is defective. Change tape
Not O.K.
Replace tape player

CHART 10



1. MOTOR ANTENNA WON'T EXTEND OR RETRACT

Clean and polish the surface of the antenna rod.

Is the radio power switch "ON ?"

Switch it ON.

Is voltage (approx. 12V) applied to the radio's motor antenna terminal ?

Repair or replace the radio or wiring

Is the antenna bent ?

Repair the bend, or replace the antenna rod.

Is the antenna relay O.K. ?

Replace the antenna relay.

Is the motor O.K. ?

Replace the motor.

Repair the antenna ground.

2. MOTOR ANTENNA EXTENDS AND RETRACTS BUT DOES NOT RECEIVE

Is the antenna itself O.K. ?

Replace the antenna.

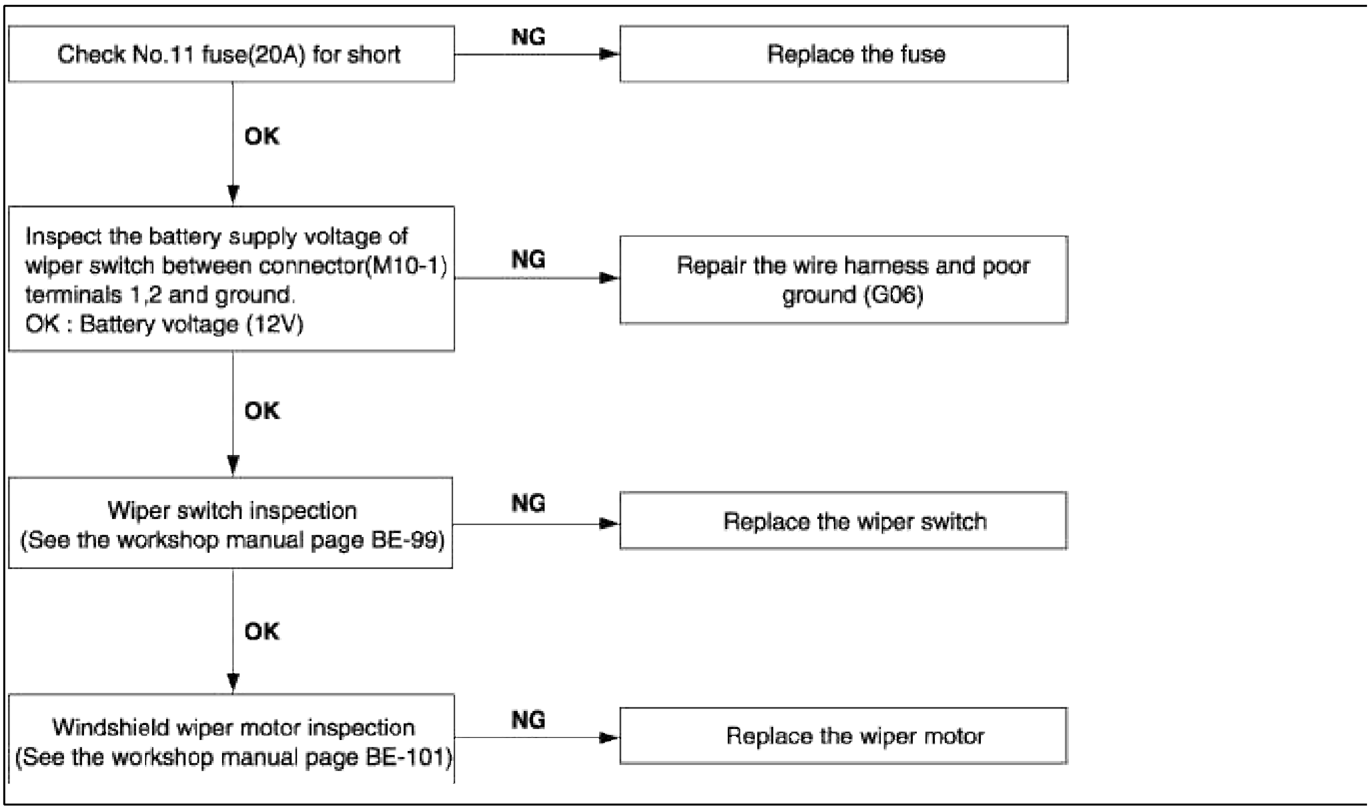
Is operation normal when a new antenna assembly is installed ?

Refer to "Radio troubleshooting" (Chart 2.)

Replace the feeder cable.

WINDSHIELD WIPER

1. Wiper low and wiper high does not work.



Check No.11 fuse(20A) for short

Replace the fuse

Inspect the battery supply voltage of wiper switch between connector(M10-1) terminals 1,2 and ground.
OK : Battery voltage (12V)

Repair the wire harness and poor ground (G06)

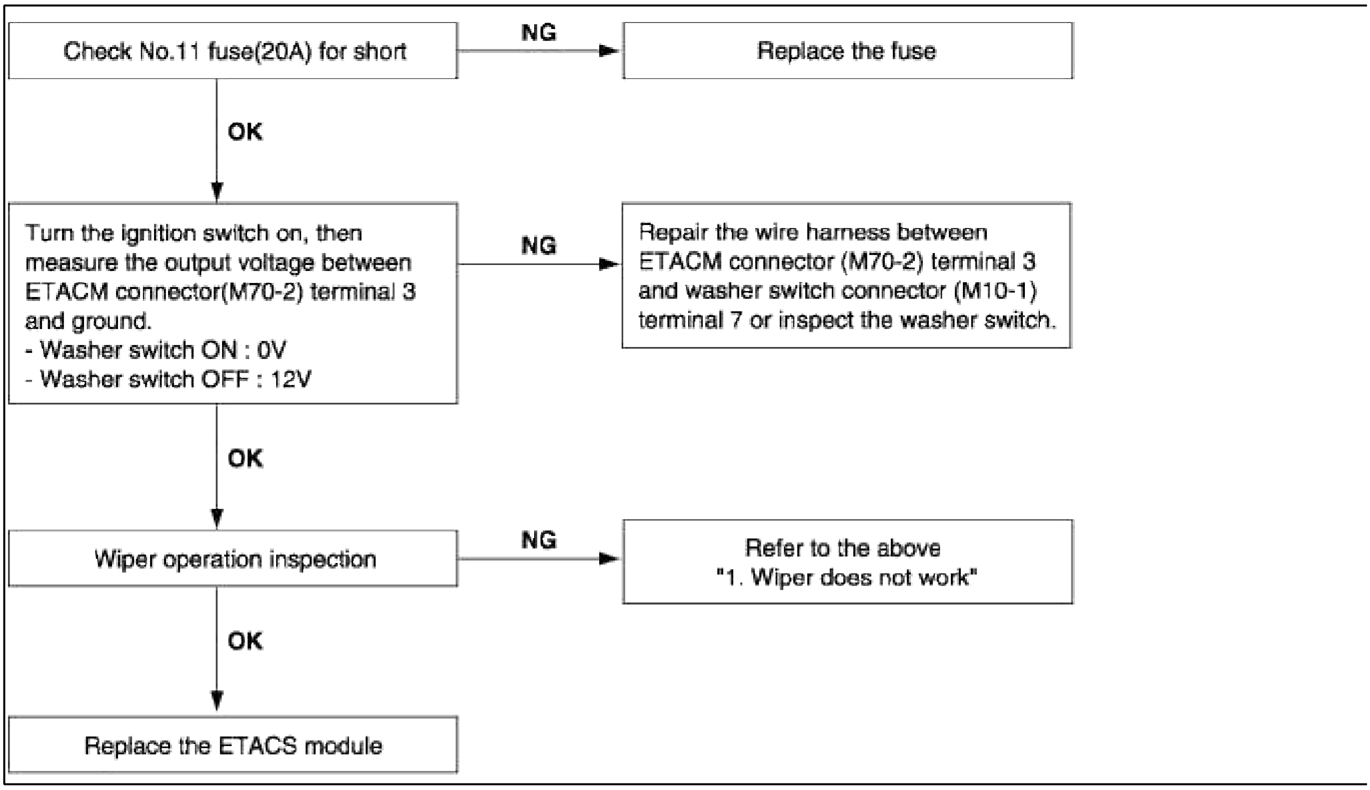
Wiper switch inspection
(See the workshop manual page BE-99)

Replace the wiper switch

Windshield wiper motor inspection
(See the workshop manual page BE-101)

Replace the wiper motor

2. When washer switch is on, wiper does not work.



Check No.11 fuse(20A) for short

Replace the fuse

Turn the ignition switch on, then measure the output voltage between ETACM connector(M70-2) terminal 3 and ground.
- Washer switch ON : 0V
- Washer switch OFF : 12V

Repair the wire harness between ETACM connector (M70-2) terminal 3 and washer switch connector (M10-1) terminal 7 or inspect the washer switch.

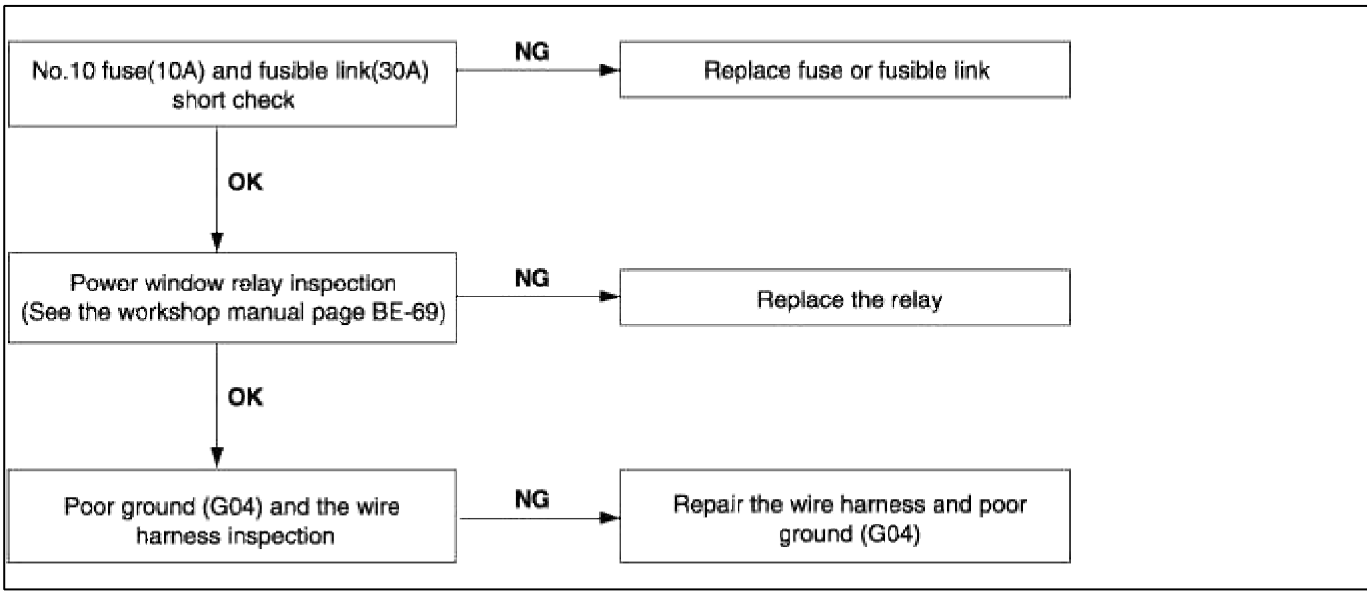
Wiper operation inspection

Refer to the above
"1. Wiper does not work"

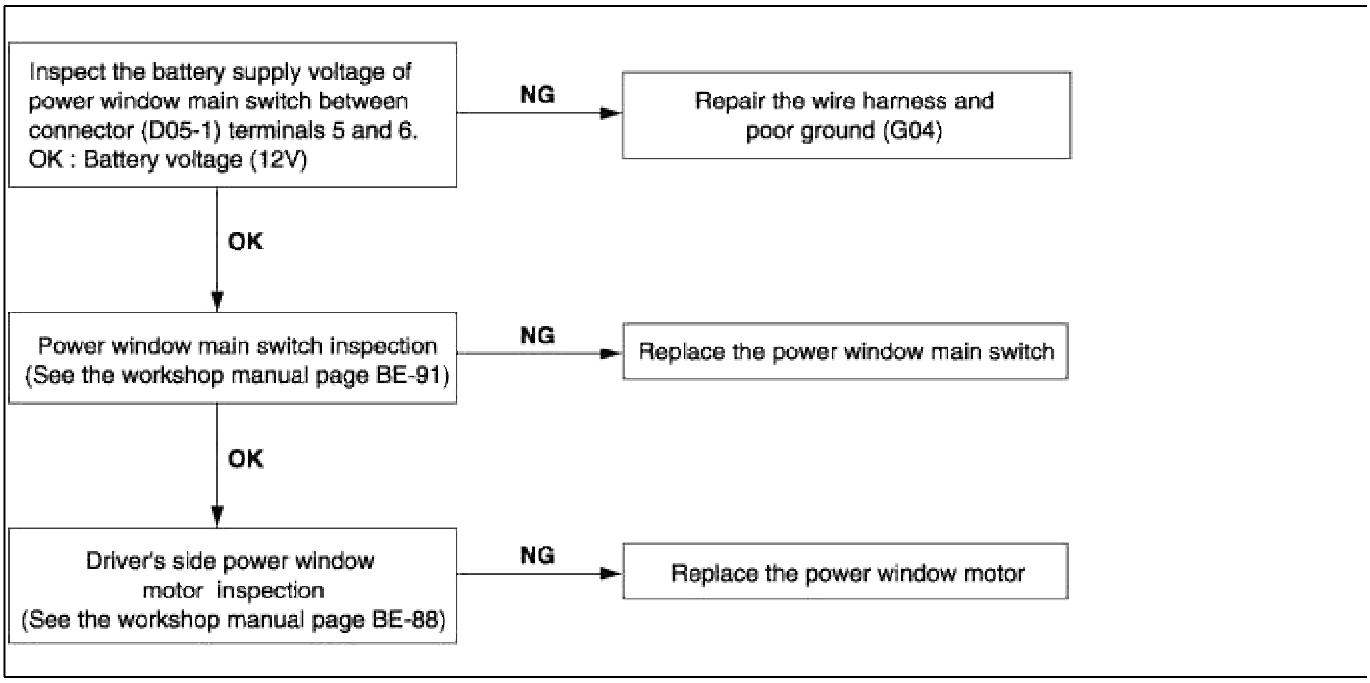
Replace the ETACS module

POWER WINDOW

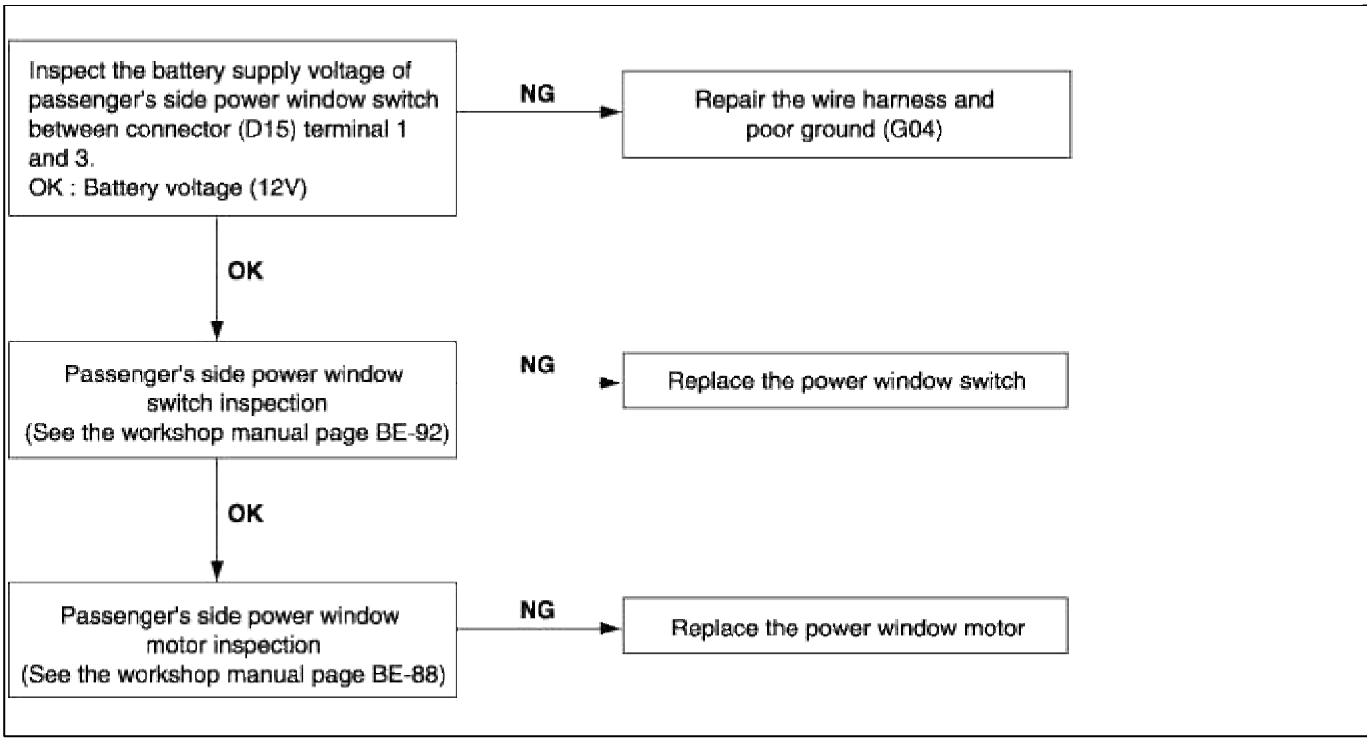
1. No windows operate from the main switch on the driver's door.


No.10 fuse(10A) and fusible link(30A) short check
NG
Replace fuse or fusible link
OK
Power window relay inspection (See the workshop manual page BE-69)
NG
Replace the relay
OK
Poor ground (G04) and the wire harness inspection
NG
Repair the wire harness and poor ground (G04)

2. Driver's side window does not operate.

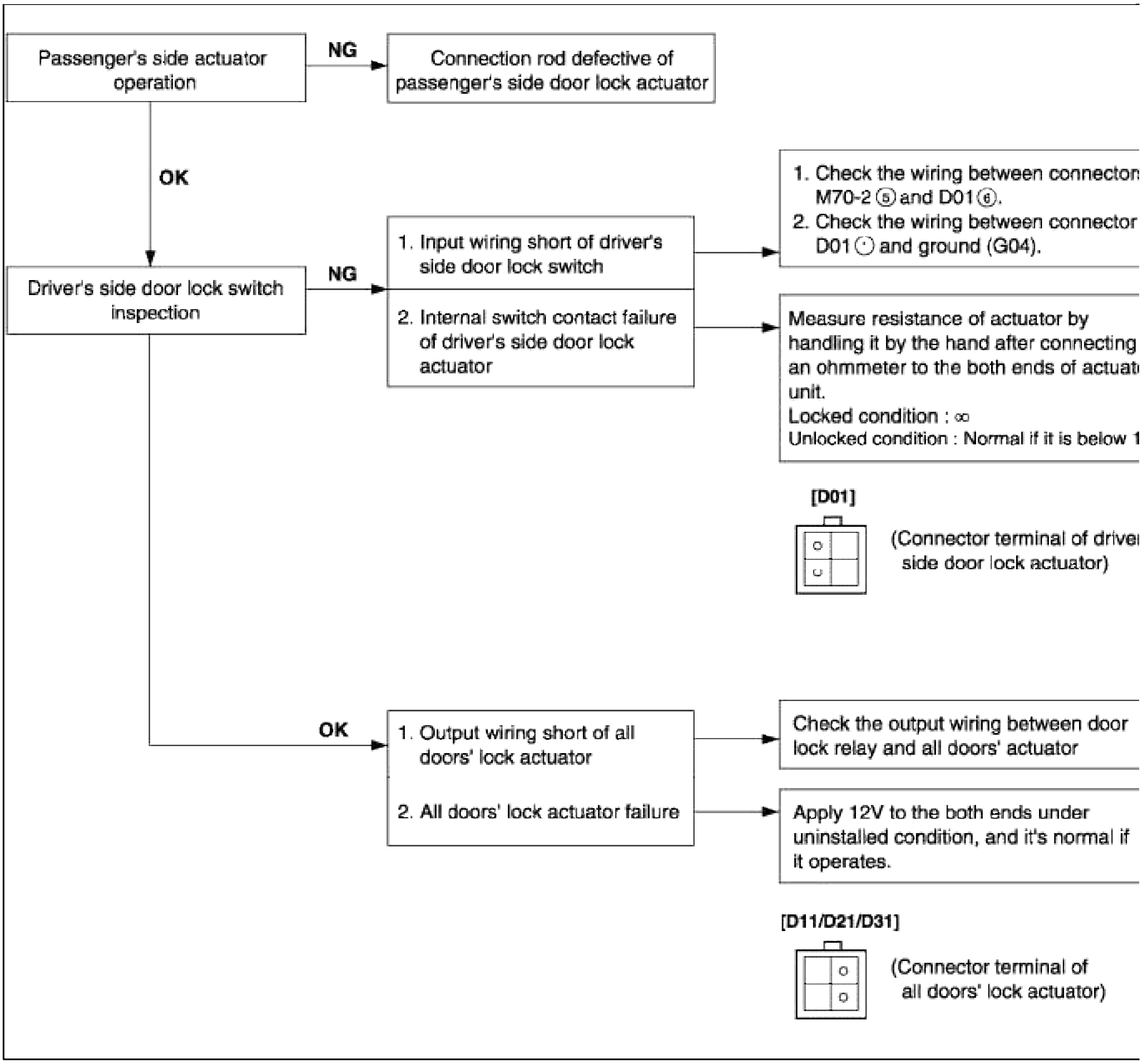

Inspect the battery supply voltage of power window main switch between connector (D05-1) terminals 5 and 6.
OK : Battery voltage (12V)
NG
Repair the wire harness and poor ground (G04)
OK
Power window main switch inspection (See the workshop manual page BE-91)
NG
Replace the power window main switch
OK
Driver's side power window motor inspection (See the workshop manual page BE-88)
NG
Replace the power window motor

3. Passenger's side window does not operate.


Inspect the battery supply voltage of passenger's side power window switch between connector (D15) terminal 1 and 3.
OK : Battery voltage (12V)
NG
Repair the wire harness and poor ground (G04)
OK
Passenger's side power window switch inspection (See the workshop manual page BE-92)
NG
Replace the power window switch
OK
Passenger's side power window motor inspection (See the workshop manual page BE-88)
NG
Replace the power window motor

POWER DOOR LOCK

1. Lock function works but unlock function does not interlock.
   → Since door unlock relay has failed, replace the door unlock relay.
2. Unlock function works but lock function does not interlock.
   → Since door lock relay has failed, replace the door lock relay.
3. When passenger side knob is controlled, all doors interlock, but when driver side knob is controlled, all doors do interlock.



Passenger's side actuator operation

Connection rod defective of passenger's side door lock actuator

Driver's side door lock switch inspection

1. Input wiring short of driver's side door lock switch
2. Internal switch contact failure of driver's side door lock actuator

1. Check the wiring between connecto M70-2 ⑤ and D01 ⑥.
2. Check the wiring between connector D01 ⊙ and ground (G04).

Measure resistance of actuator by handling it by the hand after connecting an ohmmeter to the both ends of actuat unit.
Locked condition : ∞
Unlocked condition : Normal if it is below 1

(Connector terminal of drive side door lock actuator)

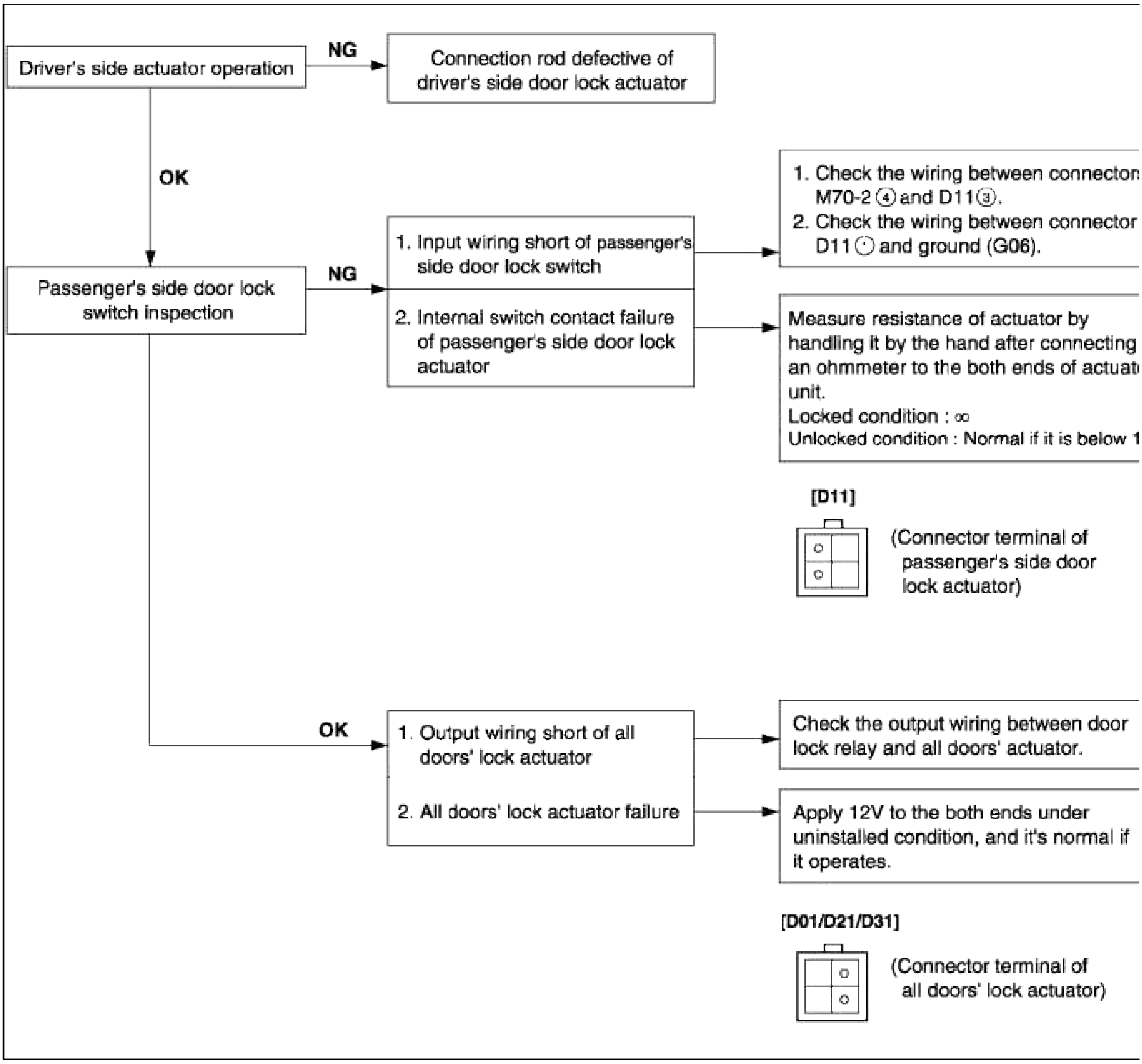
1. Output wiring short of all doors' lock actuator
2. All doors' lock actuator failure

Check the output wiring between door lock relay and all doors' actuator

Apply 12V to the both ends under uninstalled condition, and it's normal if it operates.

(Connector terminal of all doors' lock actuator)

4. When passenger side knob is controlled. All doors interlock. But when the driver side knob is controlled, all door do not interlock.



Driver's side actuator operation

Connection rod defective of driver's side door lock actuator

Passenger's side door lock switch inspection

1. Input wiring short of passenger's side door lock switch
2. Internal switch contact failure of passenger's side door lock actuator

1. Check the wiring between connecto M70-2 ④ and D11③.
2. Check the wiring between connector D11 ① and ground (G06).

Measure resistance of actuator by handling it by the hand after connecting an ohmmeter to the both ends of actuat unit.
Locked condition : ∞
Unlocked condition : Normal if it is below 1

[D11]

(Connector terminal of passenger's side door lock actuator)

1. Output wiring short of all doors' lock actuator
2. All doors' lock actuator failure

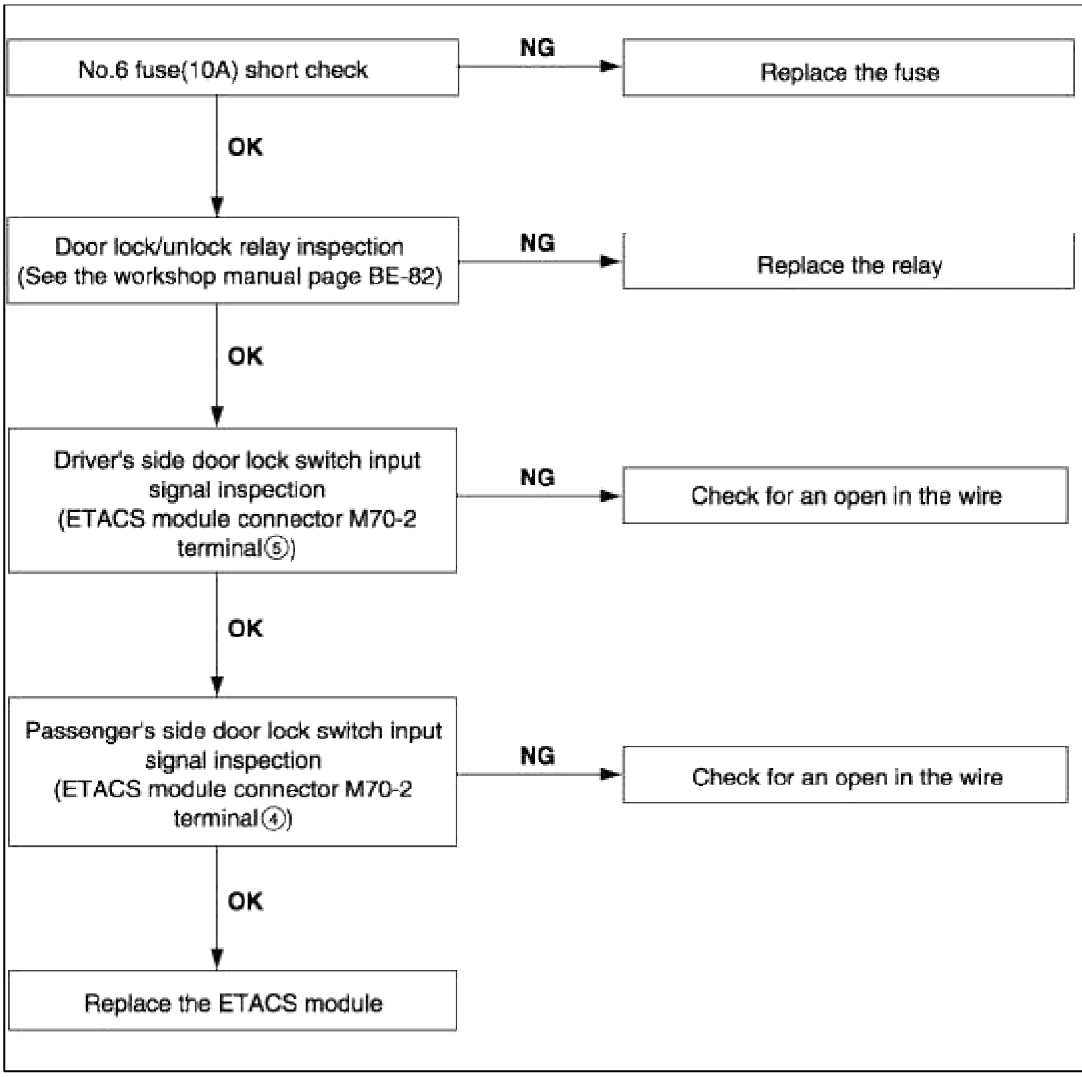
Check the output wiring between door lock relay and all doors' actuator.

Apply 12V to the both ends under uninstalled condition, and it's normal if it operates.

[D01/D21/D31]

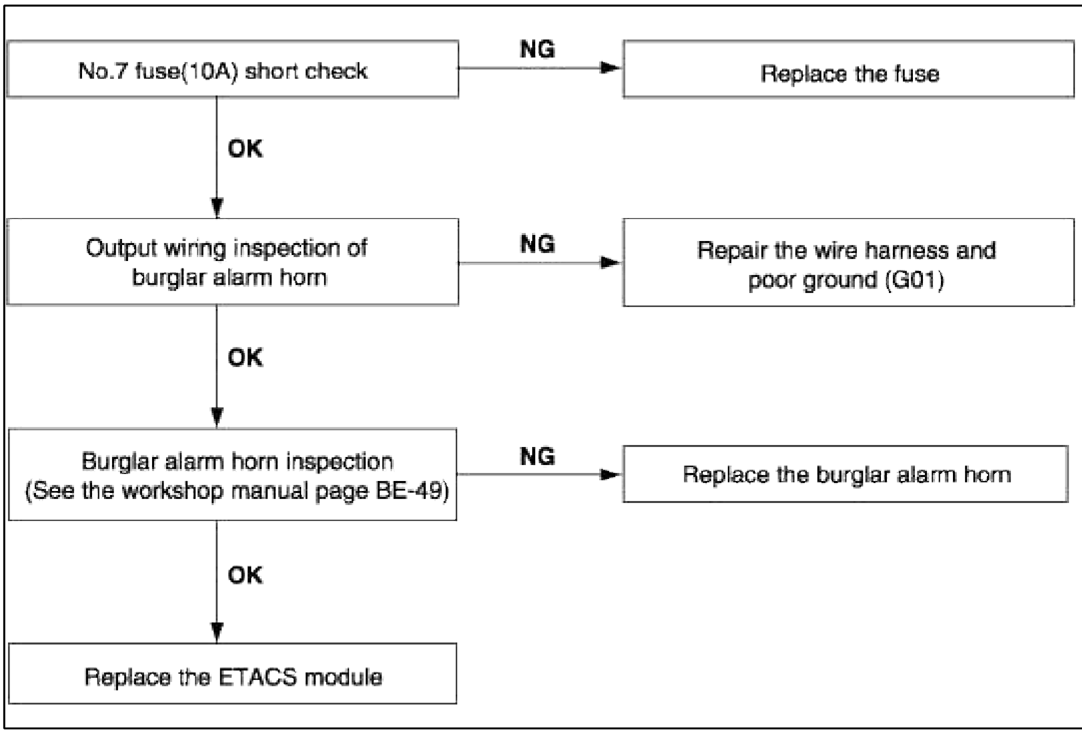
(Connector terminal of all doors' lock actuator)

5. Both sides do not interlock either.

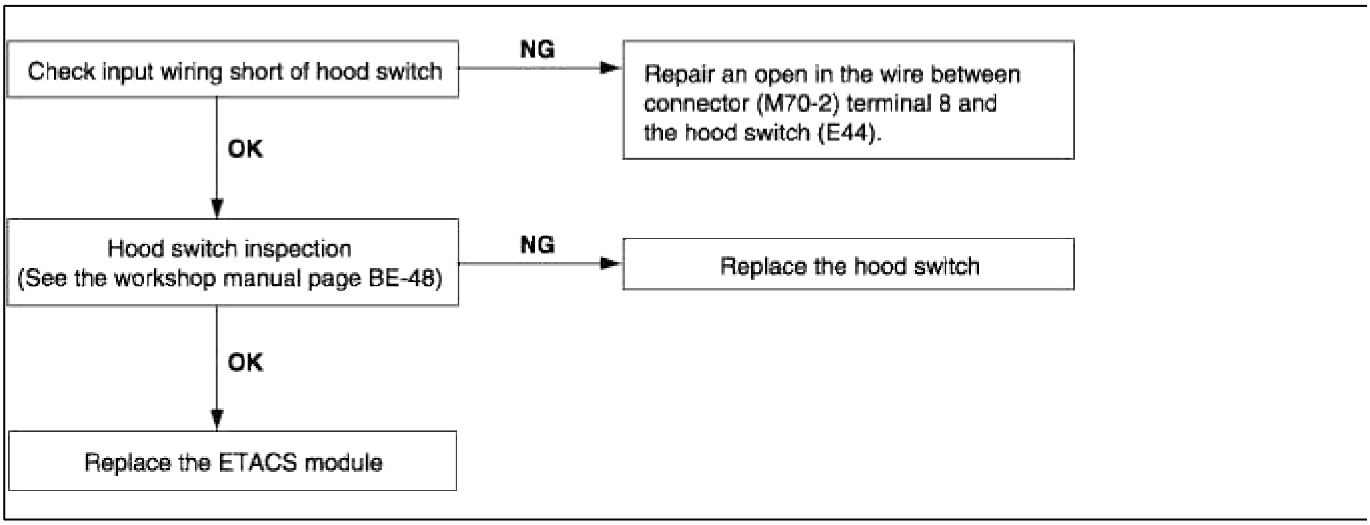

No.6 fuse(10A) short check
NG
Replace the fuse
OK
Door lock/unlock relay inspection
(See the workshop manual page BE-82)
NG
Replace the relay
OK
Driver's side door lock switch input signal inspection
(ETACS module connector M70-2 terminal⑤)
NG
Check for an open in the wire
OK
Passenger's side door lock switch input signal inspection
(ETACS module connector M70-2 terminal④)
NG
Check for an open in the wire
OK
Replace the ETACS module

KEYLESS ENTRY & BURGLAR ALARM SYSTEM

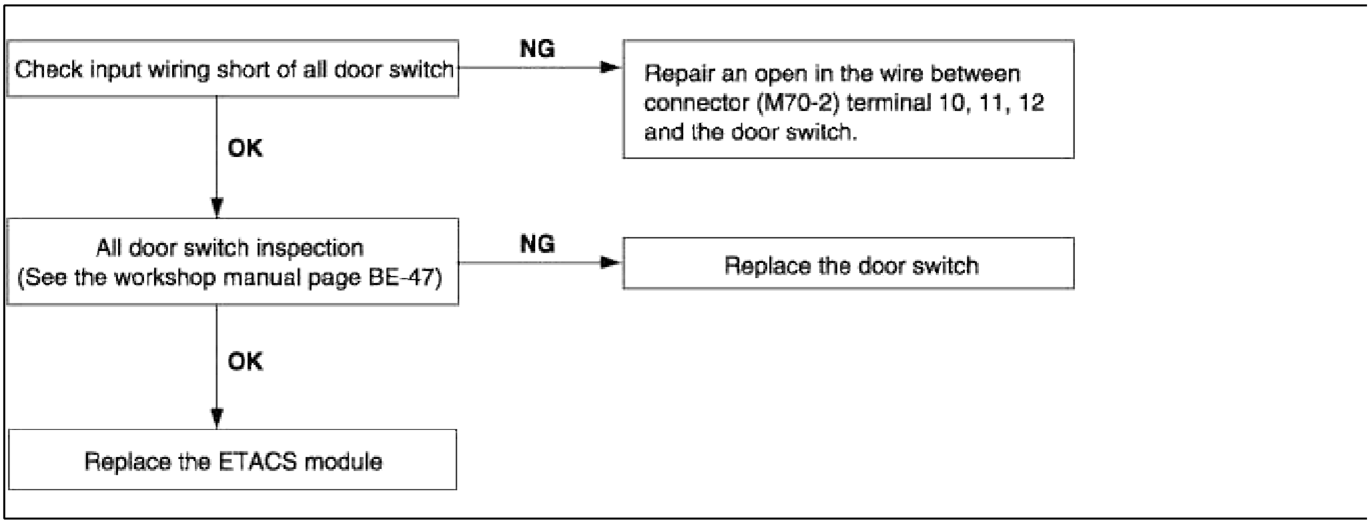
1. Alarm does not work. (Hazard lamp works)


No.7 fuse(10A) short check
NG
Replace the fuse
OK
Output wiring inspection of burglar alarm horn
NG
Repair the wire harness and poor ground (G01)
OK
Burglar alarm horn inspection
(See the workshop manual page BE-49)
NG
Replace the burglar alarm horn
OK
Replace the ETACS module

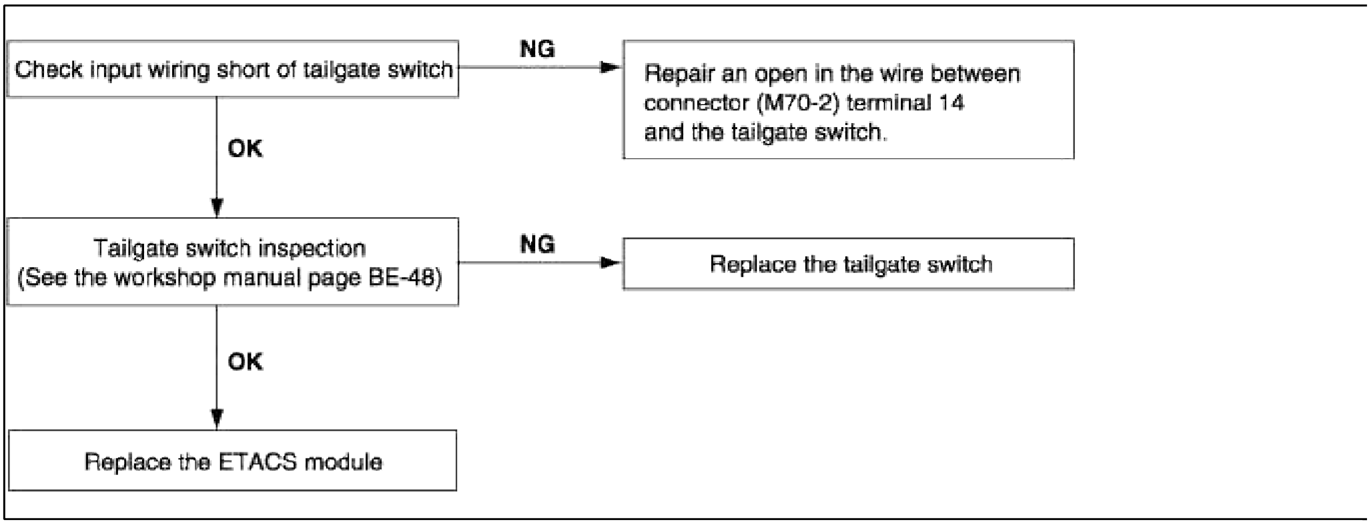
2. When hood is opened inside the car like alarm test, horn does not work.


Check input wiring short of hood switch
NG
Repair an open in the wire between connector (M70-2) terminal 8 and the hood switch (E44).
OK
Hood switch inspection (See the workshop manual page BE-48)
NG
Replace the hood switch
OK
Replace the ETACS module

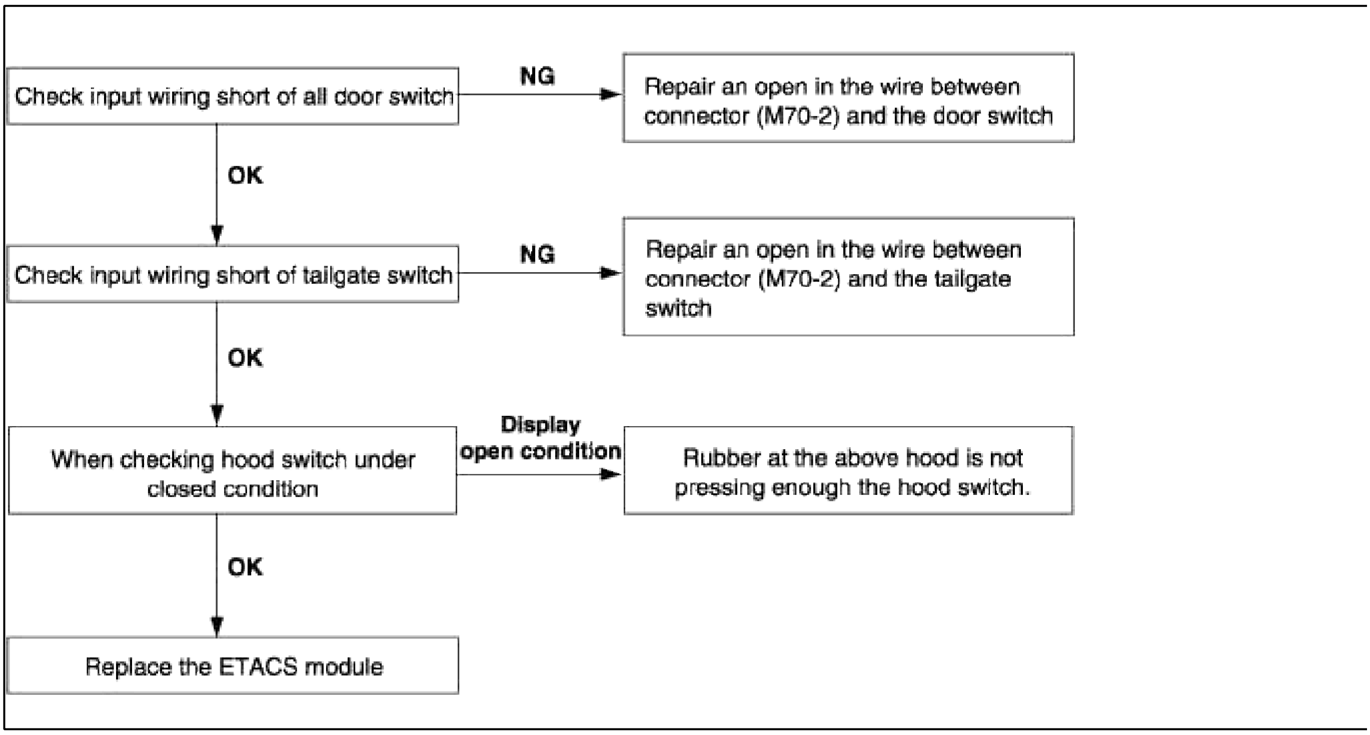
3. When door is opened inside the car like alarm test, horn does not work (If tailgate and hood is opened, alarm works)


Check input wiring short of all door switch
NG
Repair an open in the wire between connector (M70-2) terminal 10, 11, 12 and the door switch.
OK
All door switch inspection (See the workshop manual page BE-47)
NG
Replace the door switch
OK
Replace the ETACS module

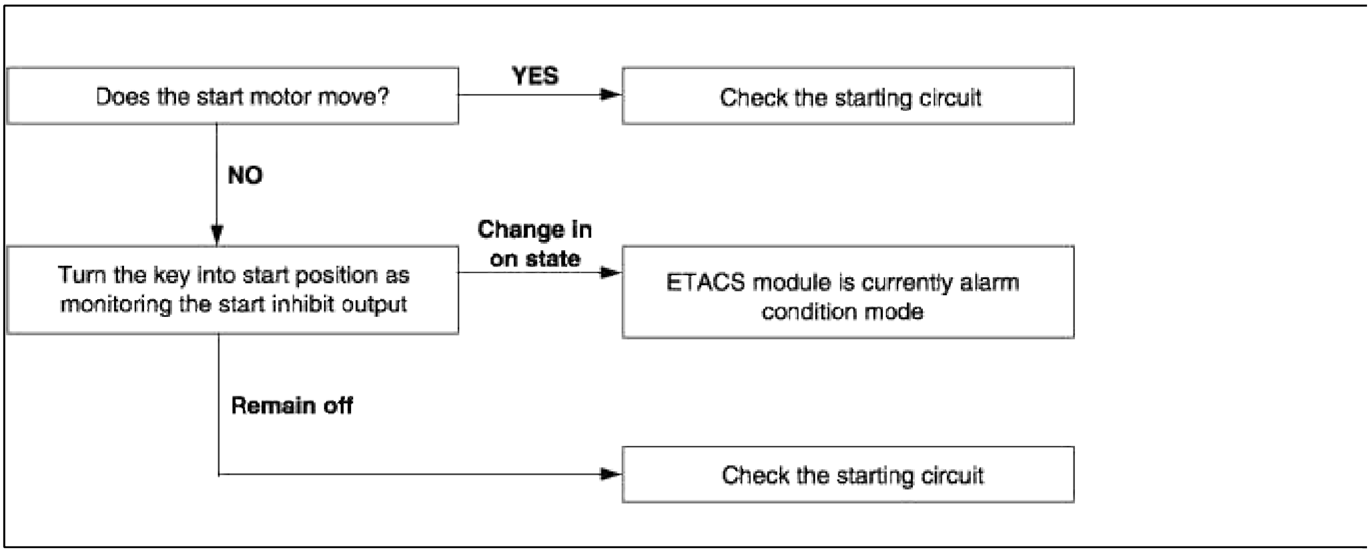
4. When tailgate is opened inside the car like alarm test, horn does not work.


Check input wiring short of tailgate switch
NG
Repair an open in the wire between connector (M70-2) terminal 14 and the tailgate switch.
OK
Tailgate switch inspection (See the workshop manual page BE-48)
NG
Replace the tailgate switch
OK
Replace the ETACS module

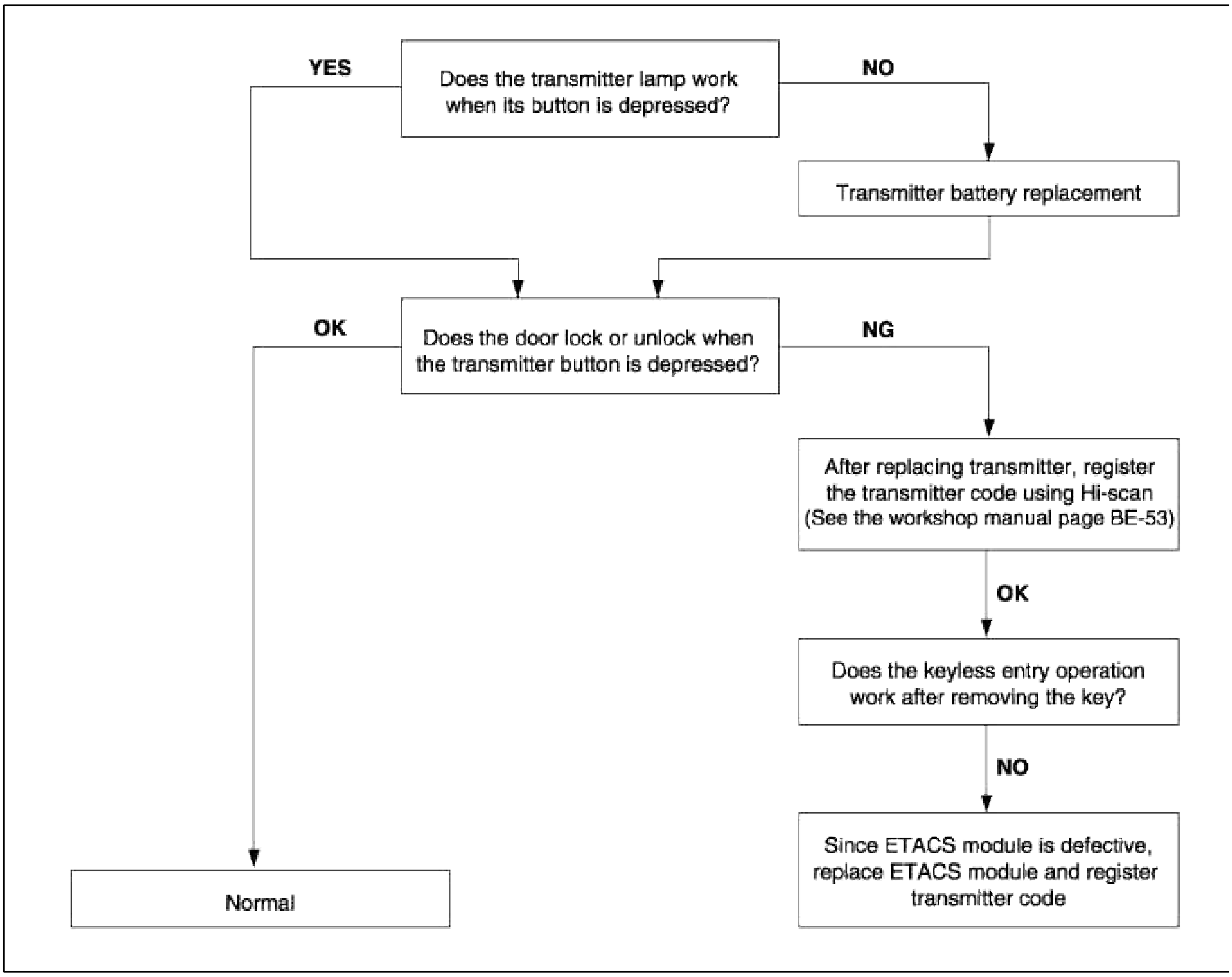
5. When the vehicle is locked by the transmitter, central door lock function works but hazard lamp doesn't blink.


Check input wiring short of all door switch
NG
Repair an open in the wire between connector (M70-2) and the door switch
OK
Check input wiring short of tailgate switch
NG
Repair an open in the wire between connector (M70-2) and the tailgate switch
OK
When checking hood switch under closed condition
Display open condition
Rubber at the above hood is not pressing enough the hood switch.
OK
Replace the ETACS module

6. Engine does not start, when the alarm released condition.


Does the start motor move?
YES
Check the starting circuit
NO
Turn the key into start position as monitoring the start inhibit output
Change in on state
ETACS module is currently alarm condition mode
Remain off
Check the starting circuit

7. Central door lock function works, but keyless entry system does not work.


Does the transmitter lamp work when its button is depressed?
YES
NO
Transmitter battery replacement
Does the door lock or unlock when the transmitter button is depressed?
OK
NG
After replacing transmitter, register the transmitter code using Hi-scan (See the workshop manual page BE-53)
OK
Does the keyless entry operation work after removing the key?
NO
Since ETACS module is defective, replace ETACS module and register transmitter code
Normal

Body Electrical System > General Information > Specifications

SPECIFICATIONS

MULTIFUNCTION SWITCH

Items	Specifications
Rated voltage	DC 12 V
Operating temperature range	-30°C ~ +80°C (-22 ~ +176°F)
Rated load	
Dimmer & passing switch	High : 15A (Lamp load) Low : 10A (Lamp load) Passing : 15A (Lamp load)
Lighting switch	Lighting : 0.22±0.05A (Relay load)
Turn signal & lane change switch	6.6±0.5A (Lamp load)
Wiper & mist switch	Low, High : 4A (Motor load) Intermittent : 0.22±0.05A (Relay load) Lock : Max. 23A (Motor load)
Washer switch	Mist : 4A (Motor load)
Variable intermittent volume switch	4A (Motor load)
Horn switch	Max. 25mA

	1A (Relay load)

INSTRUMENTS AND WARNING SYSTEM

Warning lamps	Bulb wattage (W)	Color
Illumination	Bulb type : 12V, 1.5W EL type : 47V, 470 Hz	White green
High beam	LED	Blue
Low fuel	LED	Amber
Turn signal (LH, RH)	LED	Green
Battery (charge)	LED	Red
Oil pressure	LED	Red
Air bag	Bulb (1.1W)	Red
Parking brake	LED	Red
Seat belt	LED	Red
Check engine	Bulb (1.1W)	Amber
ABS	Bulb (1.1W)	Amber
Door ajar	LED	Red
Trunk lid open	LED	Amber
OD OFF	LED	Amber

INDICATORS AND GAUGE

Items	Specifications
Speedometer	
Type	o Stepper motor type
Input spec.	o Hall IC type : 4 pulses/rev.
Indication	o Km/h : 637rpm x 4 pulses/rev. indicates 60Km/h o MPH : 1025 rpm x 4 pulses/rev. indicates 60MPH
Standard values	

Velocity (km/h)	20	40	60	80	100
Tolerance (km/h)	20-24.4	40-44.4	61-65.4	81-86.5	102-107.5
Velocity (km/h)	120	140	160	180	200
Tolerance (km/h)	123-128.5	144-149.5	165-170.5	185-191.5	207-212.5

Velocity (MPH)	10	20	40	60
Tolerance (MPH)	10-13	20-22	40-43	60-63.8
Tolerance (MPH)	10±1.5	20±1.5	40±1.5	60±1.7
Velocity (MPH)	80	100	120	Remark
Tolerance (MPH)	80.3-84.1	100.3-104.1	120.3-124.1	Except U.S.A
Tolerance (MPH)	80±1.7	100±1.7	120±1.7	U.S.A

o Tap the speedometer to prevent hysterisis effects during inspection.

Items	Specifications
Tachometer	
Type	o Stepper motor type (4cyl : 2pulses/rev, 4cyl : 4pulses/rev)
Standard values	

Revolution (RPM)	1,000	2,000	3,000	4,000	5,000	6,000	7,000
Tolerance (RPM)	±100	±125	±150	±170	±200	±240	±280

o Tap the tachometer to prevent hysterisis effects during inspection.

Items	Specifications
Fuel gauge	
Type	o Stepper motor type
Standard values	

Level	Gauge	
	Resistance (Ω)	Gauge angle (˚)
E (Empty)	184	0 ± 4.0
1/2	66	50 ± 4.0
F (Full)	15	100 ± 4.0

o Inspection order : E → F → E

Items	Specifications
Temperature gauge	
Type	o Stepper motor type
Indication standard	

Temperature	Angle (˚)	Assembled tolerance (˚)
55˚C	0	-
85˚C ~ 110˚C	43	±4.0
125˚C	95	±4.0
Red zone (over 125˚C)	100	-

o Inspection order : OFF → C → H

Resistance of temperature sender (NTC)

Temperature (˚C)	55	85	110	125	Red zone (Over125˚C)
Resistance (Ω)	160.3	70.3	27.9	18.6	15

LIGHTING SYSTEM

Items	Bulb wattage (W)
Head lamp	60W /55W (High / Low beam)
Front turn signal lamp	27W
Front position lamp	5W
Front fog lamp	27W
Side marker lamp	5W
Rear combination lamps Tail/stop lamp Back up lamp Turn signal lamp	 8W / 28W 17W 27W
Luggage lamp	5W
Room lamp	10W
Center high mounted stop lamp	17W
Map lamp	10W x 2
License plate lamp	5W

AUDIO

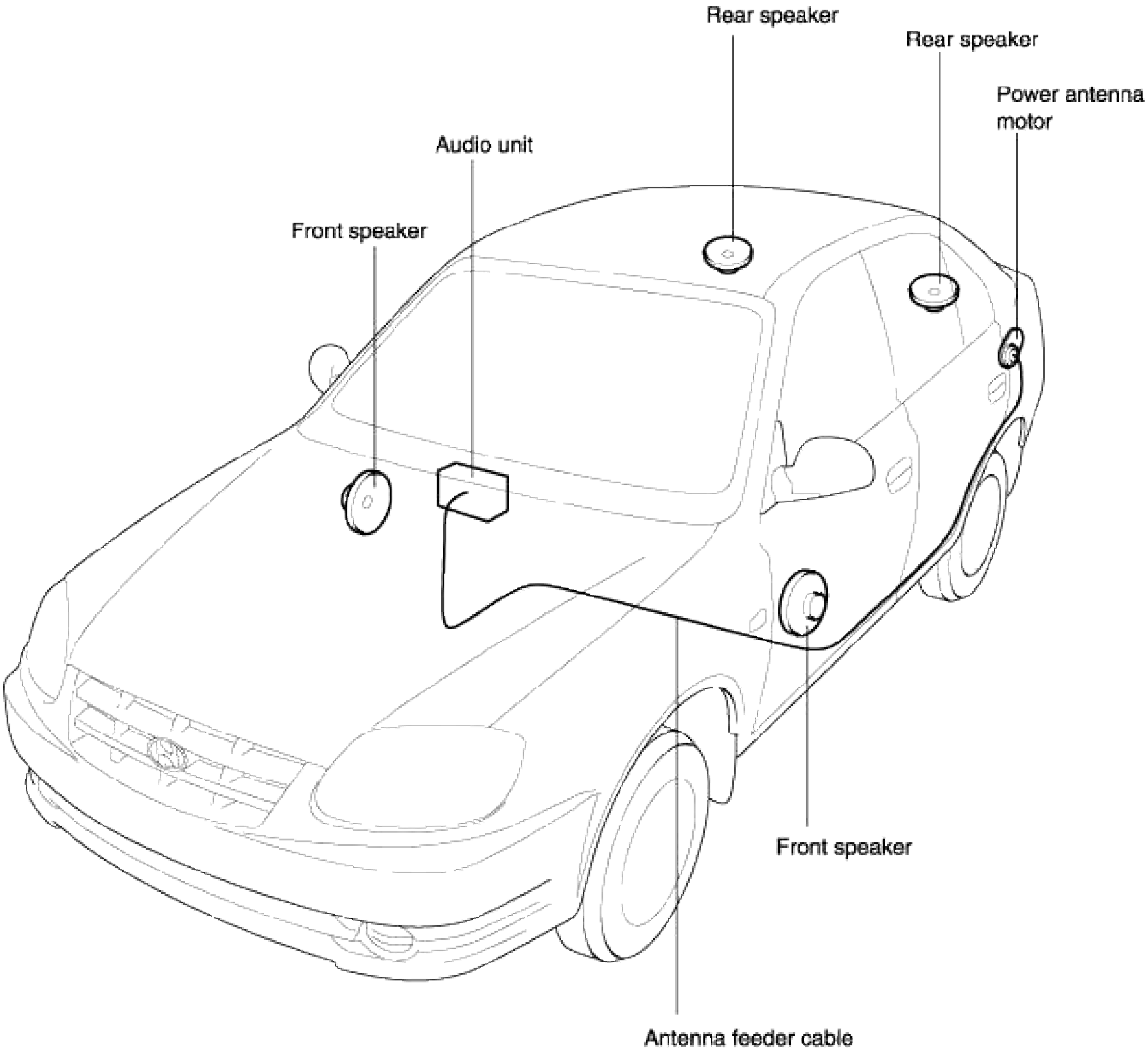
Items	H210	H240, H260
Rated output	Max. 20W x 2	Max. 20W x 4
Load impedance	4Ω x 4	4Ω x 4
Band	AM/FM	AM/FM
Tuning type	PLL Synthesized type	PLL Synthesized type
Dark current	Max. 2mA	Max. 2mA
Frequency range / Channel	AM : 530 ~ 1710KHZ/10 KHZ	AM : 530 ~ 1710KHZ/10 KHZ
	FM : 87.9 ~ 107.9MHZ/200 KHZ	FM : 87.9 ~ 107.9 MHZ/200KHZ

WINDSHIELD WIPER AND WASHER

Items	Specifications
Wiper motor	
Speed/current at 10kg·cm load test (1.0 Nm, 0.7 lb·ft)	Low : 44~52 rpm/3.5A or less High : 64~78 rpm/4.5A or less
Speed/current at 40kg·cm load test (3.9 Nm, 2.9 lb·ft)	Low : 39~47 rpm/5.5A or less High : 56~68 rpm/7.0A or less
Current when locking	Low : 24A or less High : 28A or less
Windshield washer	
Motor type	DC ferrite magnet
Pump type	Centrifugal type
Current	3.8A
Discharge pressure	1.2 kg/cm^2 or more
Flow rate	1,320 cc/min. or more
Overload capacity (Continuous operation)	
With water	60 sec. or less
Without water	20 sec. or less

Body Electrical System > Audio > Components and Components Location

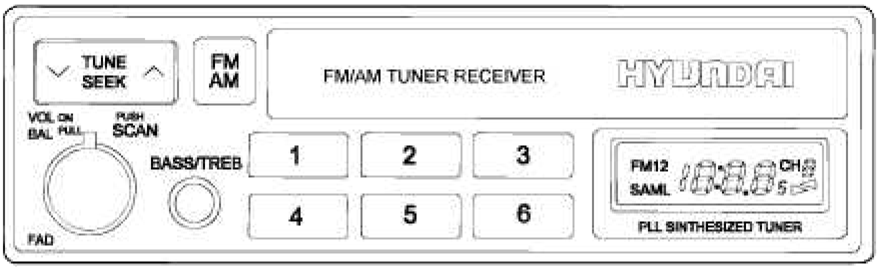
COMPONENTS


Rear speaker
Rear speaker
Power antenna motor
Audio unit
Front speaker
Front speaker
Antenna feeder cable

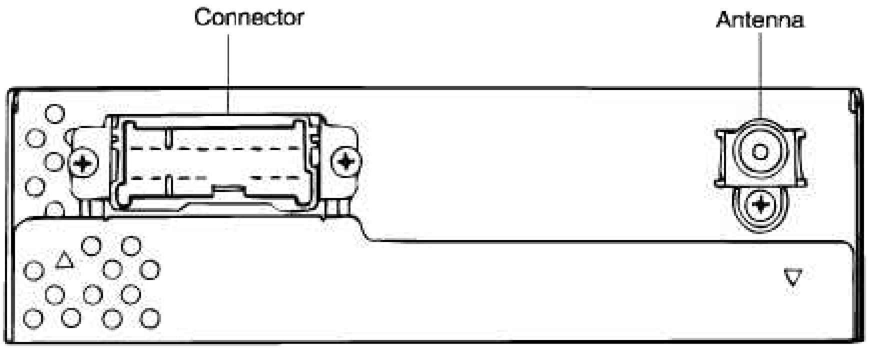
Body Electrical System > Audio > Audio Unit > Components and Components Location

COMPONENTS

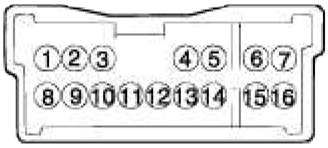
[H210]


TUNE
SEEK
FM
AM
FM/AM TUNER RECEIVER
HYUNDAI
VOL ON
BAL PULL
PUSH
SCAN
BASS/TREB
1
2
3
4
5
6
FAD
FM12
SAML
CH
PLL SINTHESIZED TUNER

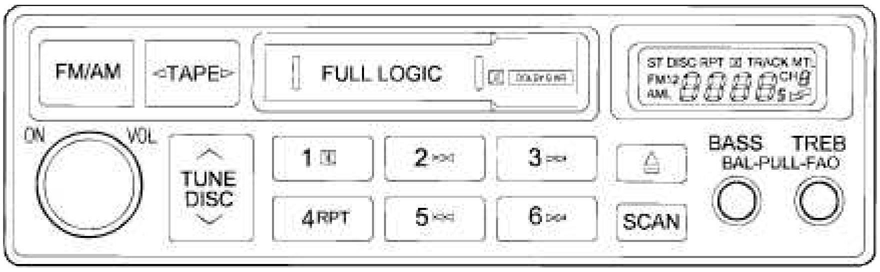
ETJA001W


Connector
Antenna

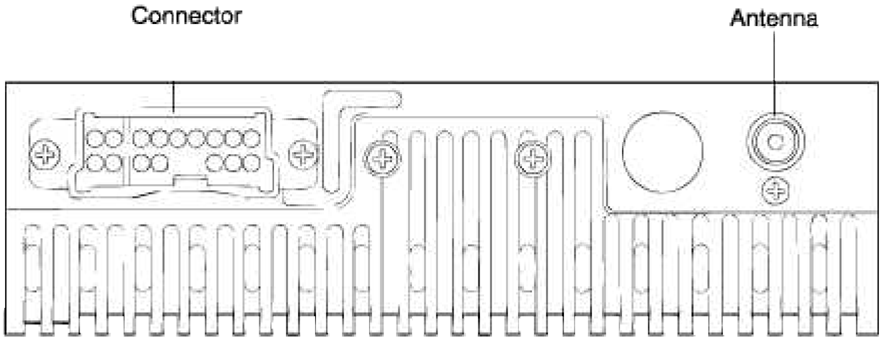
ETJA001X

Connector	Terminal	Description
 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 ETJA001C	1	Antenna
	2	Rear left speaker(-)
	3	Front left speaker(-)
	4	Front right speaker(-)
	5	Rear right speaker(-)
	6	Illumination(-)
	7	ACC(+)
	8	Ground
	9	Rear left speaker(+)
	10	Front left speaker(+)
	11	N.C.
	12	N.C.
	13	Front right speaker(+)
	14	Rear right speaker(+)
	15	Illumination(+)
	16	Battery(+)

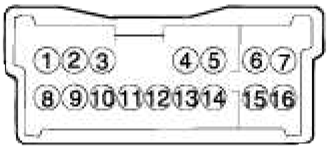
[H240]


FM/AM
◁TAPE▷
FULL LOGIC
ST DISC RPT TRACK MT
FM1/2
AML
CH
ON
VOL
TUNE
DISC
1
2
3
4RPT
5
6
SCAN
BASS
TREB
BAL-PULL-FAO

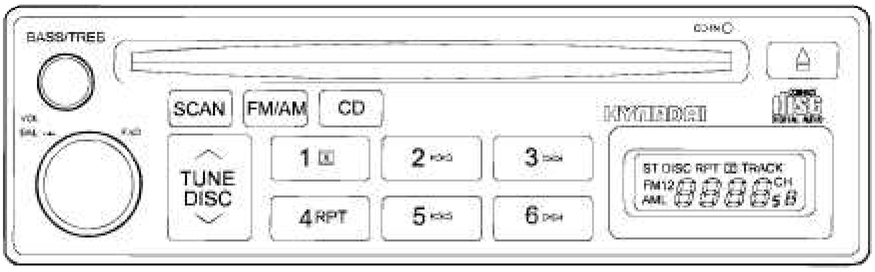
ETJA001B


Connector
Antenna

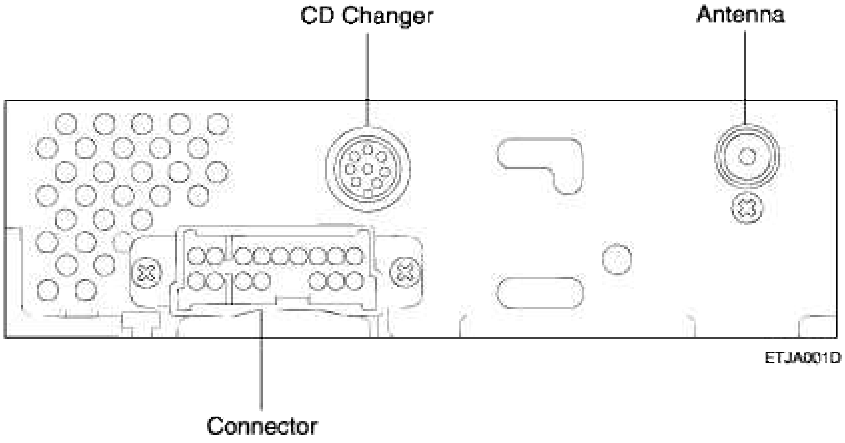
ETJA001A

Connector	Terminal	Description
 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 ETJA001C	1	Antenna
	2	Rear left speaker(-)
	3	Front left speaker(-)
	4	Front right speaker(-)
	5	Rear right speaker(-)
	6	Illumination(-)
	7	ACC(+)
	8	Ground
	9	Rear left speaker(+)
	10	Front left speaker(+)
	11	N.C.
	12	N.C.
	13	Front right speaker(+)
	14	Rear right speaker(-)
	15	Illumination(+)
	16	Battery(+)

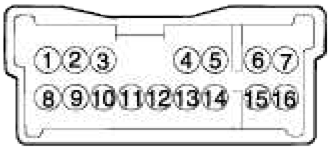
[H260]

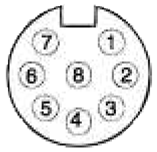

BASS/TREB
VOL
CD IN
SCAN
FM/AM
CD
TUNE
DISC
1
2
3
4 RPT
5
6
HYUNDAI
ST DISC RPT TRACK
FM12
AML
CH

ETJA001E


CD Changer
Antenna
Connector

ETJA001D

Connector	Terminal	Description
 ETJA001C	1	N.C.
	2	Rear left speaker(-)
	3	Front left speaker(-)
	4	Front right speaker(-)
	5	Rear right speaker(-)
	6	Illumination(-)
	7	ACC(+)
	8	Ground
	9	Rear left speaker(+)
	10	Front left speaker(+)
	11	N.C.
	12	N.C.
	13	Front right speaker(+)
	14	Rear right speaker(+)
	15	Illumination(+)
	16	Battery(+)

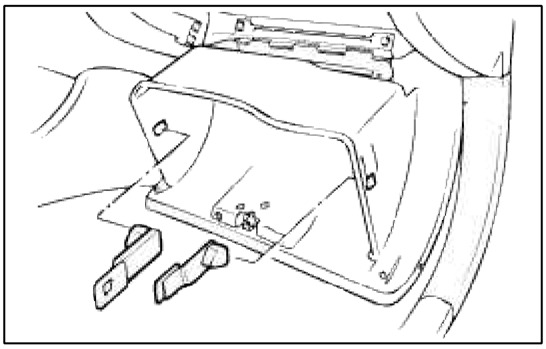
Connector	Terminal	Description
(CD Changer)  ETJA001G	1	R
	2	CD ON
	3	BUS
	4	B+
	5	M. Ground
	6	N.C.
	7	L
	8	A.Ground

Body Electrical System > Audio > Audio Unit > Repair procedures

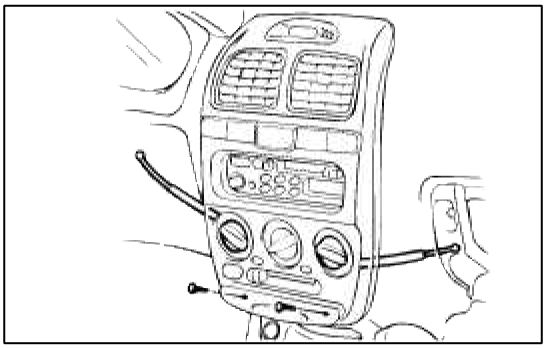
REMOVAL AND INSTALLATION

1. Disconnect the negative battery terminal.
2. Remove the glove box.

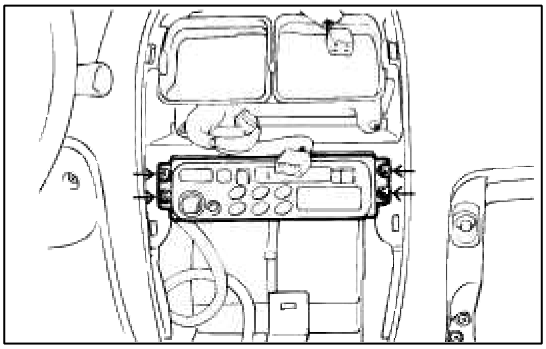
3. Disconnect the heater control cables under the glove box and lower crashpad.



4. Loosen the screws and remove the center facia panel.



5. Remove the audio mounting screws (4EA) and the audio system.

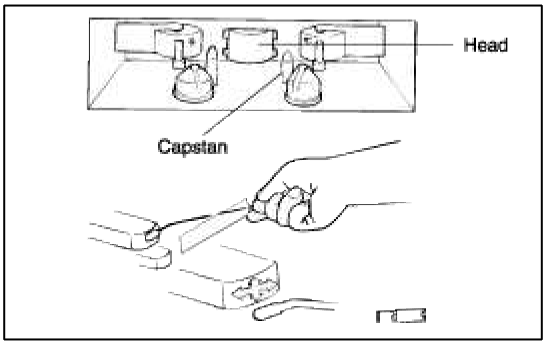


6. Installation is the reverse of removal.

INSPECTION

TAPE HEAD AND CAPSTAN CLEANING

1. To obtain optimum performance, clean the head, and capstan as often as necessary, depending on frequency of use and tape cleanness.
2. To clean the tape head and capstan, use a cotton swab dipped in ordinary rubbing alcohol. Wipe the head and capstan.

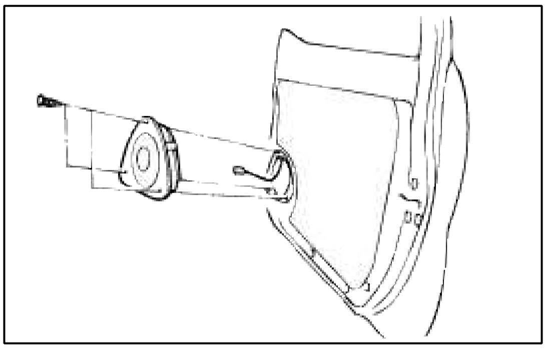


Body Electrical System > Audio > Speakers > Repair procedures

REMOVAL AND INSTALLATION

FRONT SPEAKER

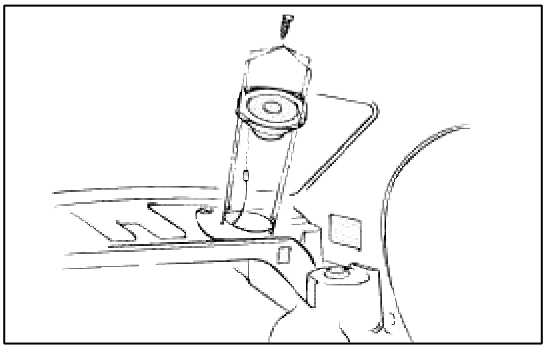
1. Remove the front door trim panel and front speaker. (Refer to BD section)



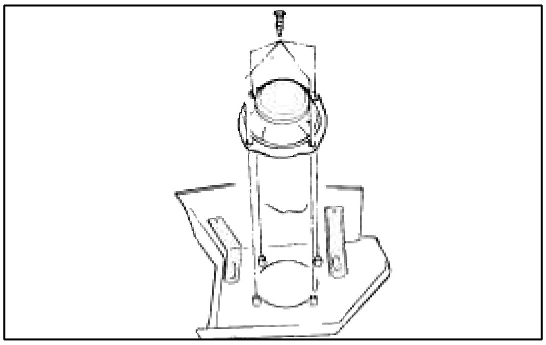
2. Installation is the reverse of removal.

REAR SPEAKER

1. Remove the rear package tray or covering shelf trim. (Refer to BD section)

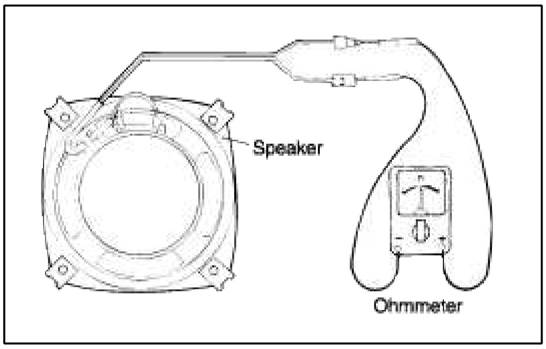


2. Remove the rear speaker.



INSPECTION

1. Check the speaker with an ohmmeter. If an ohmmeter indicates the correct impedance of the speaker when checking between the speaker (+) and speaker (-) of the same channel, the speaker is ok.
2. If a clicking sound is emitted from the speaker when the ohmmeter is connected to the speaker terminals, the speaker is ok.

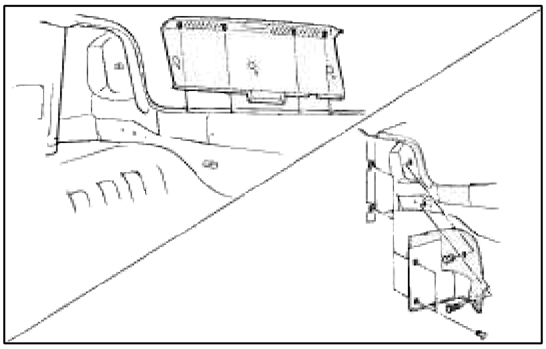


Body Electrical System > Audio > Antenna > Repair procedures

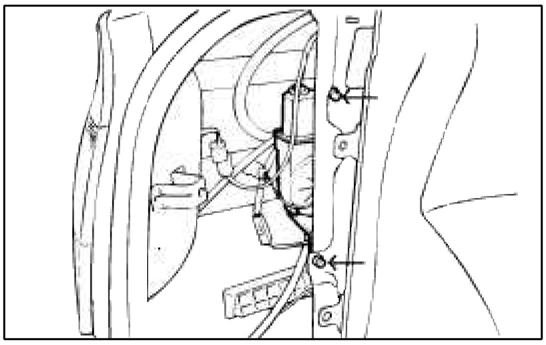
REMOVAL AND INSTALLATION

1. Disconnect the negative battery terminal.

2. Remove the rear transverse trim and left side luggage rear trim.



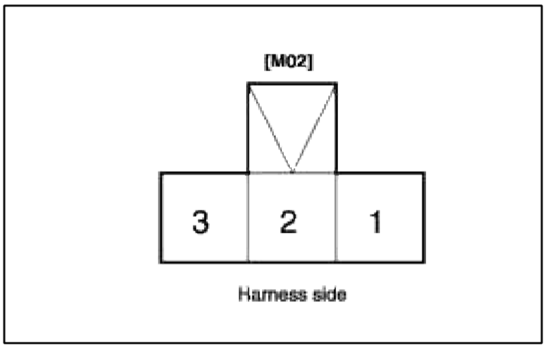
3. Remove the antenna mounting nut and bolt.
   Disconnect the wiring connector and the antenna feeder cable.



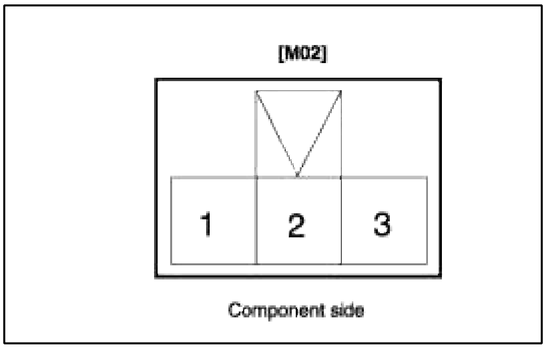
4. Installation is the reverse of removal.

INSPECTION

1. Disconnect the connector from the antenna assembly.
2. Check if the battery voltage is measured between terminal 1 and 3 of harnessside at all time.
3. Check if the battery voltage is measured between terminal 1 and 2 of the harnessside when the ignition switch and audio switch are turned on.



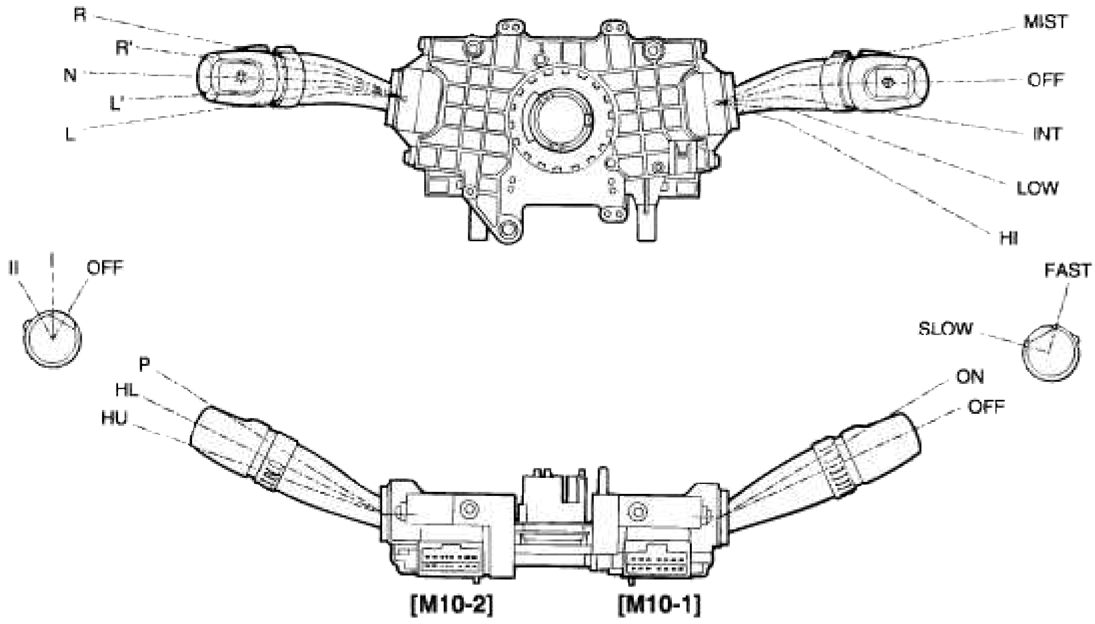
4. After connecting battery source to terminal 2 and 3 of the component side,check if the motor operates properly (Antenna moves up.)
5. Check if the motor operates (antenna moves down) when terminal 2 is disconnectedfrom battery source.



Body Electrical System > Multifunction switch > Components and Components Location

COMPONENTS

[WITHOUT AIR BAG]



M10-2

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18

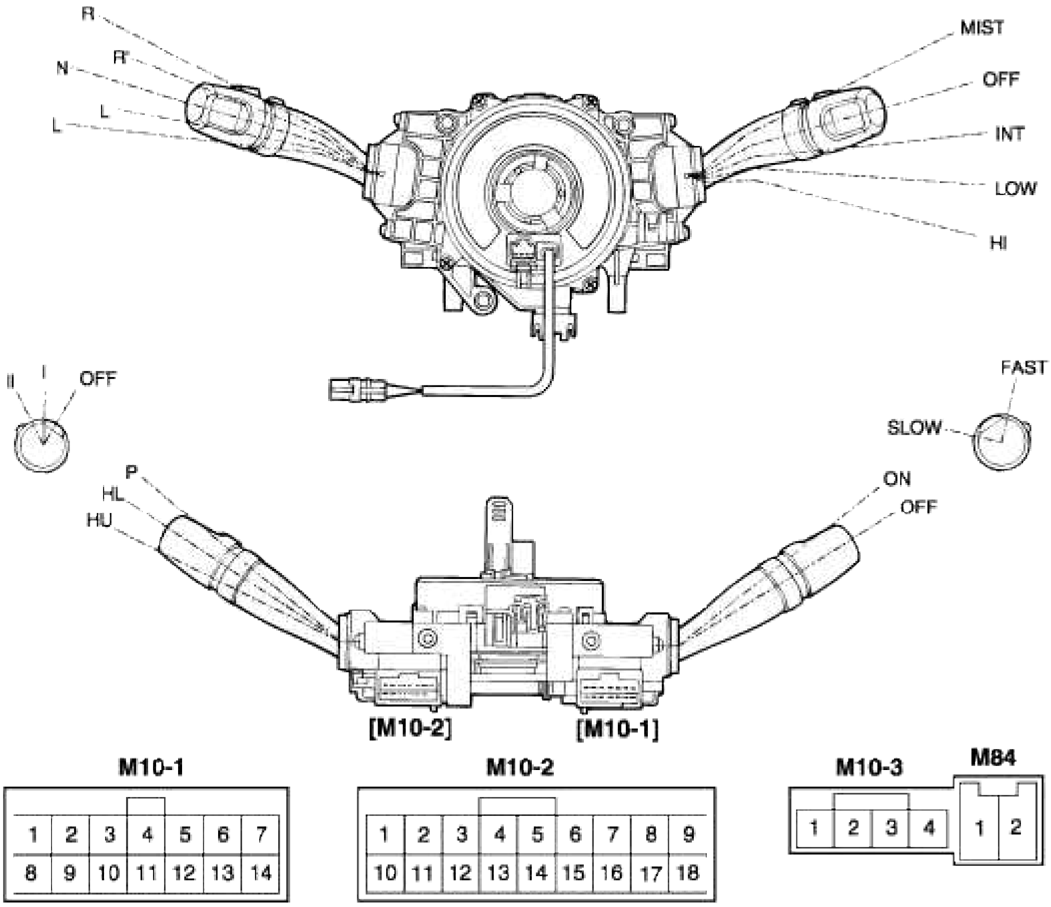
M10-1

1	2	3	4	5	6	7
8	9	10	11	12	13	14

Circuit connection

Connector No.	Terminal No.	Description	Connector No.	Terminal No.	Description
M10-2	1	Head lamp passing	M10-1	1	Wiper high speed
	2	Head lamp high beam power		2	Wiper low speed
	3	-		3	Wiper parking
	4	-		4	Mist switch
	5	-		5	Wiper & washer ground
	6	-		6	Intermittent wiper
	7	Turn signal RH lamp		7	Front washer switch
	8	Flasher unit power		8	Horn
	9	Turn signal LH lamp		9	-
	10	Head lamp low beam power		10	-
	11	Dimmer & passing ground		11	-
	12	-		12	-
	13	-		13	Intermittent wiper volume
	14	Tail lamp switch		14	Intermittent wiper ground
	15	Head lamp switch			
	16	Rear fog lamp			
	17	Lighting switch ground			
	18	-			

[WITH AIR BAG]


R
R'
N
L
L
MIST
OFF
INT
LOW
HI
II
I
OFF
FAST
SLOW
P
HL
HU
ON
OFF
[M10-2]
[M10-1]
M10-1
1 2 3 4 5 6 7
8 9 10 11 12 13 14
M10-2
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18
M10-3
1 2 3 4
M84
1 2

Circuit connection

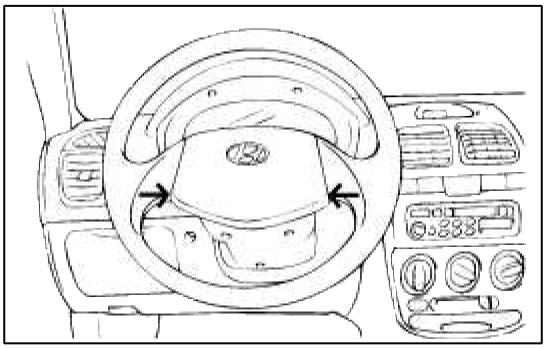
Connector No.	Terminal No.	Description	Connector No.	Terminal No.	Description
M10-2	1	Head lamp passing	M10-1	1	Wiper high speed
	2	Head lamp high beam power		2	Wiper low speed
	3	-		3	Wiper parking
	4	-		4	Mist switch
	5	-		5	Wiper & washer ground
	6	-		6	Intermittent wiper
	7	Turn signal RH lamp		7	Front washer switch
	8	Flasher unit power		8	-
	9	Turn signal LH lamp		9	-
	10	Head lamp low beam power		10	-
	11	Dimmer & passing ground		11	-
	12	-		12	-
	13	-		13	Intermittent wiper
	14	Tail lamp switch		14	Intermittent wiper ground
	15	Head lamp switch	M84	1	Driver initiator low
	16	Rear fog lamp		2	Driver initiator high
	17	Lighting switch ground	M10-3	1	Horn (B+)
	18	-		2	-
				3	-
				4	-

Body Electrical System > Multifunction switch > Multi Function Switch > Repair procedures

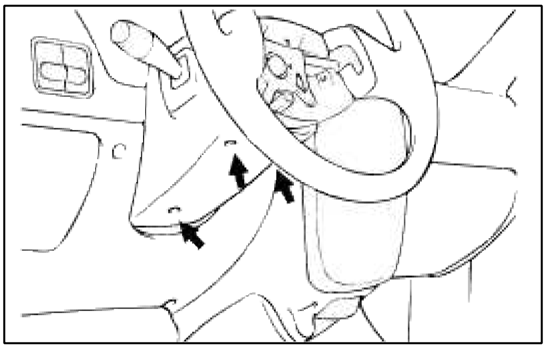
REMOVAL AND INSTALLATION

WITHOUT AIR BAG

1. Remove the horn pad and steering wheel.



2. Remove the upper and lower steering column shrouds.



3. Remove the multifunction switch assembly mounting screws and remove the multifunction switch assembly.
4. Installation is the reverse of removal.

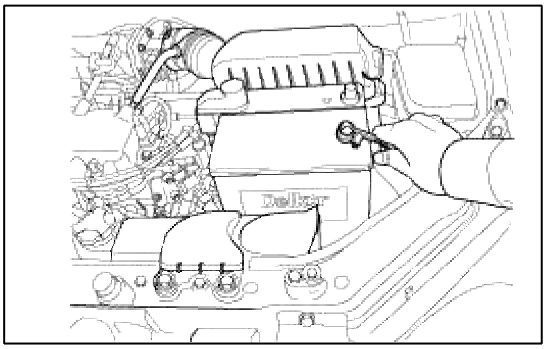
WITH AIR BAG

CAUTION

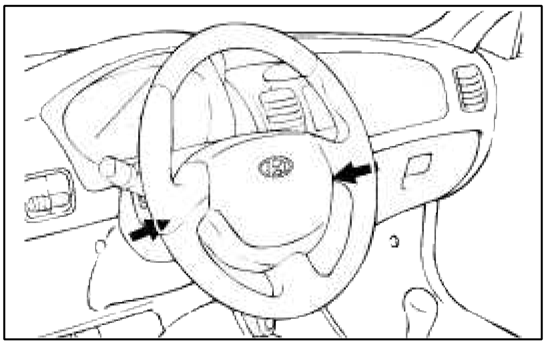
- Never attempt to disassemble or repair the air bag module or clock spring. If faulty, replace it.
- Do not drop the air bag module or clock spring or allow contact with water, grease or oil. Replace if a dent, crack, deformation or rust are detected.
- The air bag module should be stored on a flat surface and placed so that the pad surface is facing upward. Do not place anything on top of it.
- Do not expose the air bag module to temperatures over 93°C (200°F).
- After deployment of an air bag, replace the clock spring with a new one.
- Wear gloves and safety glasses when handling an air bag that has already been deployed.
- An undeployed air bag module should only be disposed of in accordance with the procedures mentioned in the Restraints section.
- When you disconnect the air bag module-clock spring connector, take care not to apply excesive force to it.
- The removed air bag module should be stored in a clean, dry place.
- Prior to installing the clock spring, align the mating mark and "NEUTRAL" position indicator of the clock spring, and, after turning the front wheels to the straight-ahead position, install the clock spring to the column switch. If the mating mark of the clock spring is not properly aligned, the steering wheel may not completely rotate during a turn, or the flat cable within the clock spring may be severed, obstructing normal operation of the SRS and possibly leading to serious injury to the vehicle's driver. To inspect the clock spring, refer to the Restraints section.

1. Disconnect the negative battery terminal.

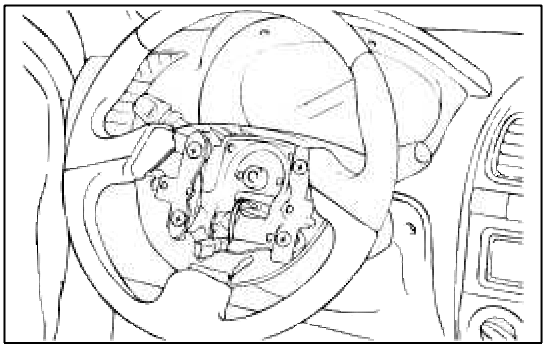
> NOTE
>
> Prior to doing any further work after disconnection of the battery cable, wait at least 30 seconds.



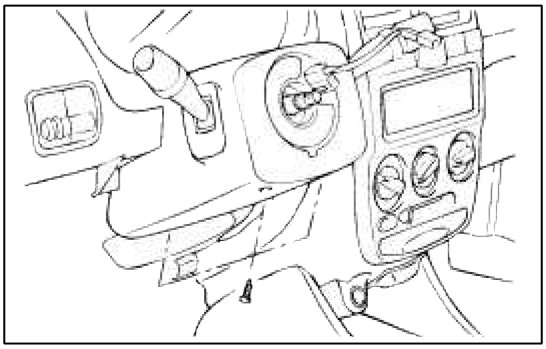
2. Remove the air bag module mounting bolts (2EA) with an asterix wrench. (Tor-x socket)
   Disconnect the horn connector and the air bag module connector, and remove the air bag module.



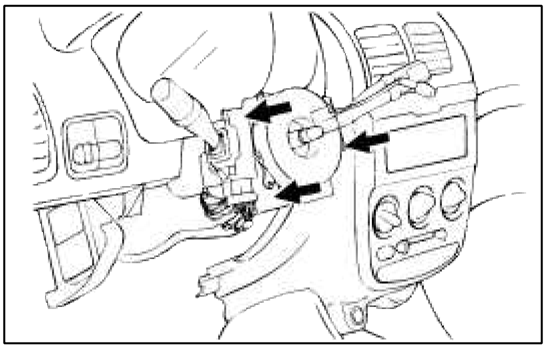
3. Remove the steering wheel after removing a nut.



4. Remove the steering column upper and lower shrouds using a phillips screwdriver.



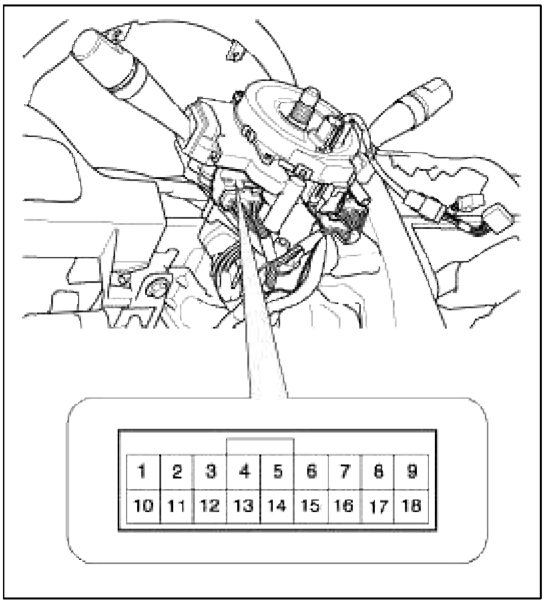
5. Remove the multifunction switch assembly mounting screws (3EA) and multifunction switch assembly after removal of the connectors.



6. Installation is the reverse of removal.

INSPECTION

LIGHTING SWITCH INSPECTION



LIGHTING SWITCH (CONNECTOR NO. : M10-2)

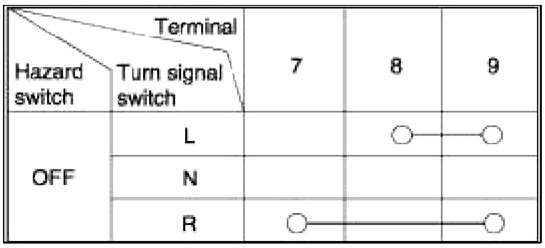
Position \ Terminal	14	15	16	17
OFF				
I	○	—	—	○
II	○	○	○	○

DIMMER AND PASSING SWITCH (CONNECTOR NO. : M10-2)

Position \ Terminal	1	2	10	11
HU		○	—	○
HL			○	○
P	○	○	—	○

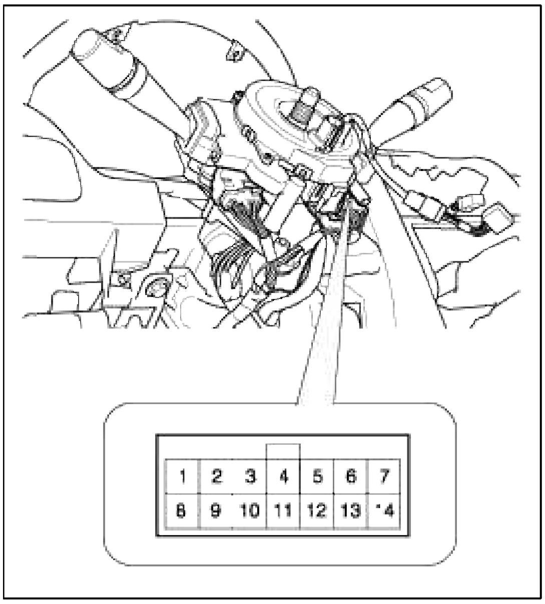
HU : Head lamp high beam
HL : Head lamp low beam
P : Head lamp passing switch

TURN SIGNAL SWITCH (CONNECTOR NO. : M10-2)

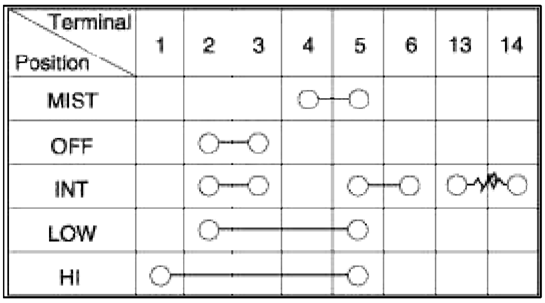


Hazard switch	Turn signal switch \ Terminal	7	8	9
OFF	L		○	○
	N			
	R	○	—	○

WIPER AND WASHER SWITCH INSPECTION

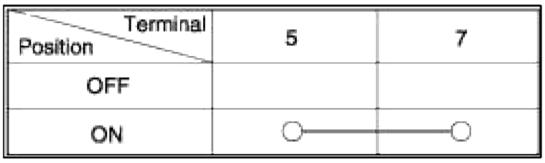


WIPER SWITCH (CONNECTOR NO. : M10-1)



Position \ Terminal	1	2	3	4	5	6	13	14
MIST				○	○			
OFF		○	○					
INT		○	○		○	○	○	○
LOW		○	—	—	○			
HI	○	—	—	—	○			

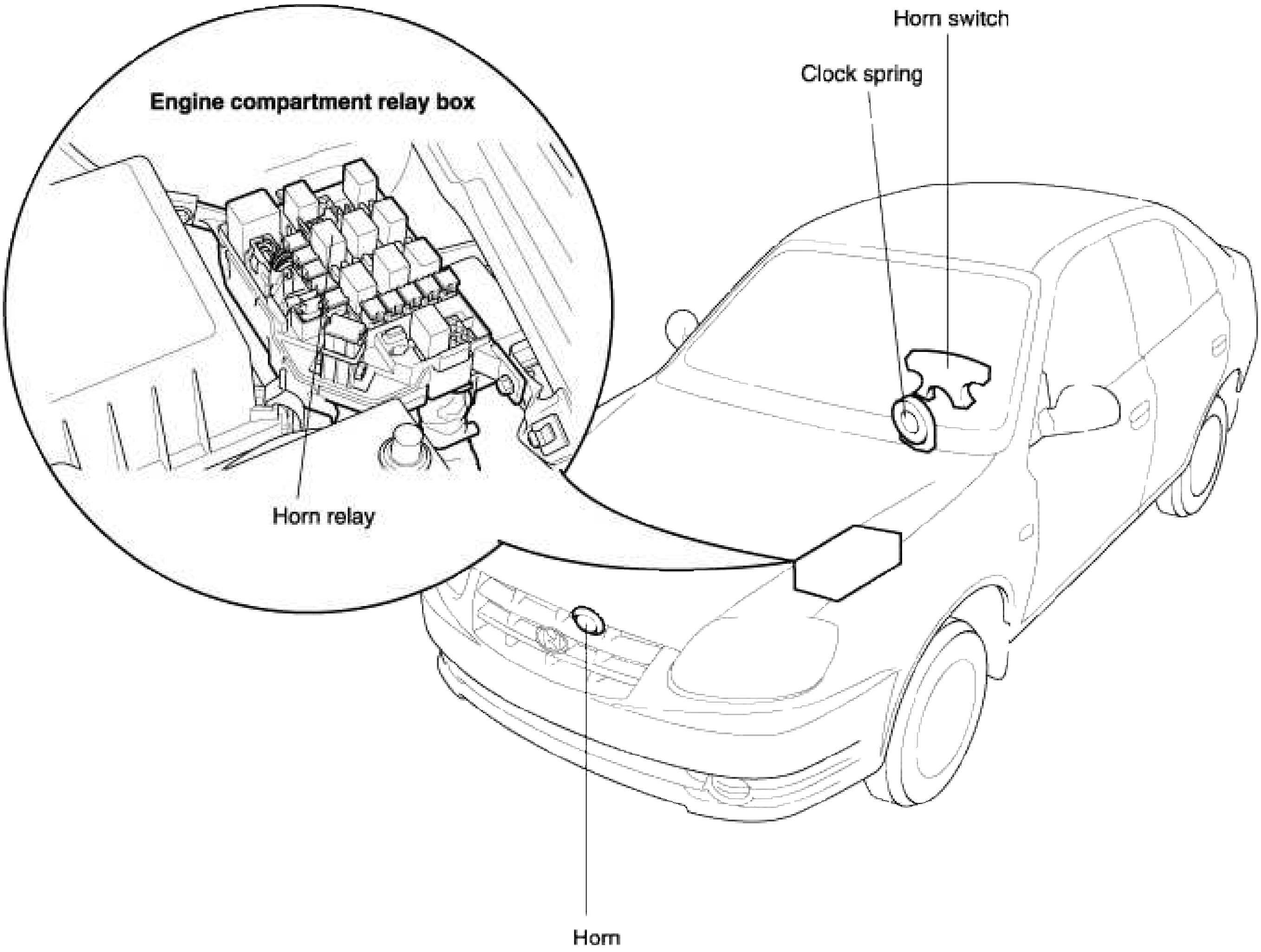
WASHER SWITCH (CONNECTOR NO. : M10-1)



Position \ Terminal	5	7
OFF		
ON	○	○

Body Electrical System > Horn > Components and Components Location

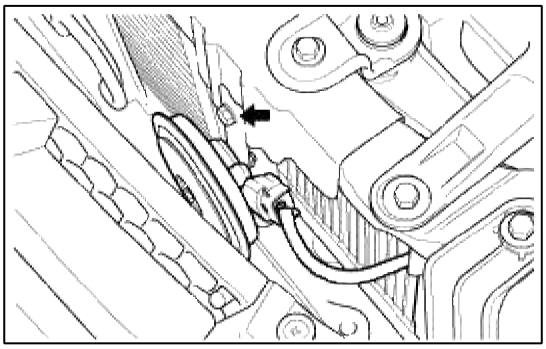
COMPONENTS


Horn switch
Clock spring
Engine compartment relay box
Horn relay
Horn

Body Electrical System > Horn > Horn > Repair procedures

REMOVAL AND INSTALLATION

1. Remove the bolt and disconnect the horn connector, then remove the horn.



2. Installation is the reverse of removal.

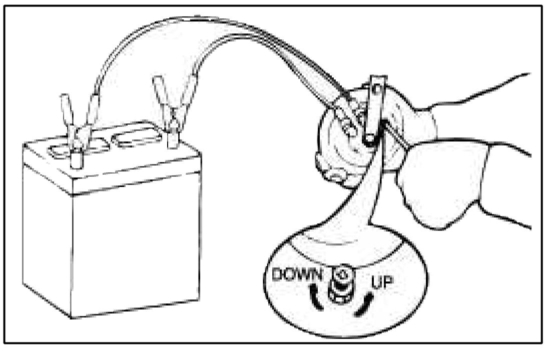
INSPECTION

1. Test the horn by connecting battery voltage to the 1 terminal and ground the 2 terminal.
2. The horn should make a sound. If the horn fails to make a sound, replace it.

ADJUSTMENT

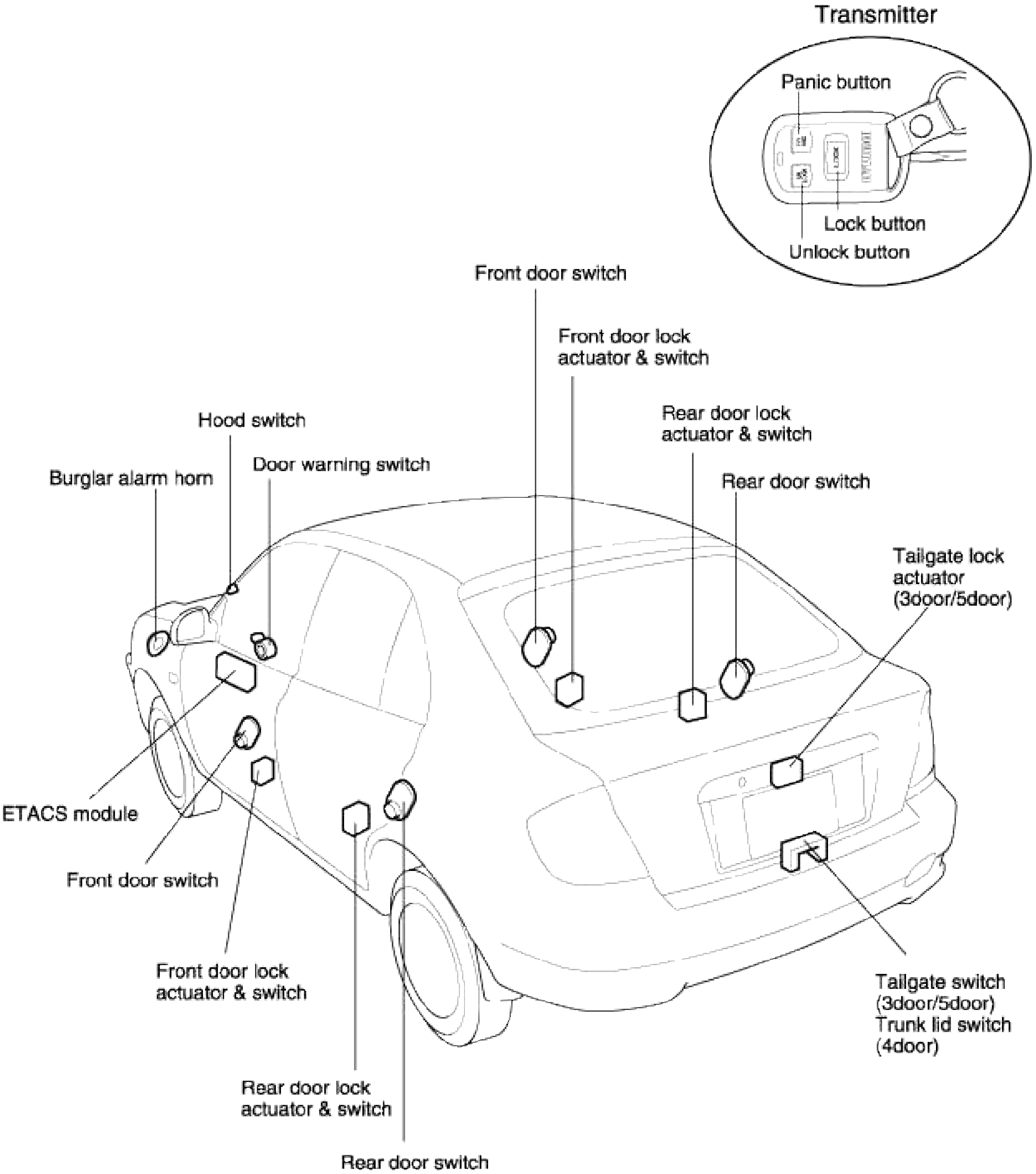
NOTE

After adjustment, apply a small amount of paint around the screw head to keep it from loosening.



Body Electrical System > Keyless Entry And > Components and Components Location

COMPONENTS


Transmitter
Panic button
Lock button
Unlock button
Front door switch
Front door lock actuator & switch
Rear door lock actuator & switch
Rear door switch
Hood switch
Burglar alarm horn
Door warning switch
Tailgate lock actuator (3door/5door)
ETACS module
Front door switch
Front door lock actuator & switch
Tailgate switch (3door/5door) Trunk lid switch (4door)
Rear door lock actuator & switch
Rear door switch

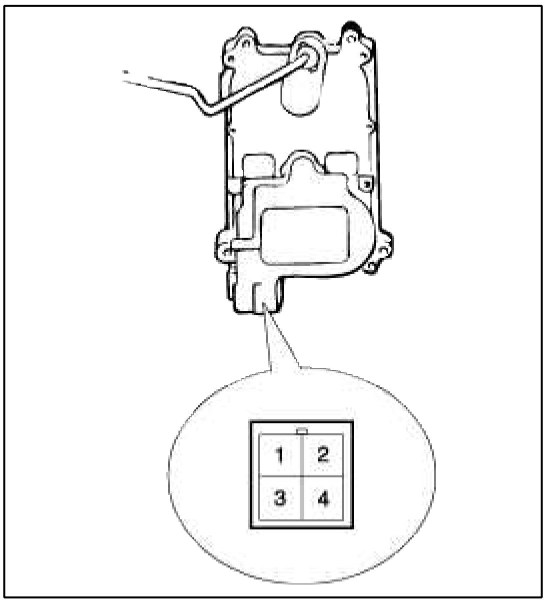
Body Electrical System > Keyless Entry And > Repair procedures

INSPECTION

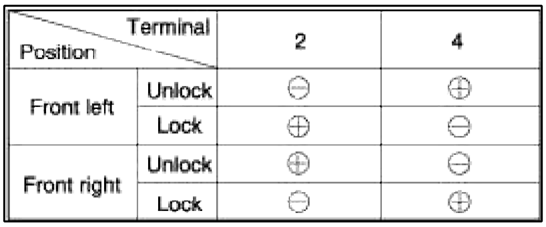
FRONT DOOR LOCK ACTUATOR INSPECTION

1. Remove the front door trim panel. (Refer to BD group-Front door)

2. Disconnect the 4P connector from the actuator.



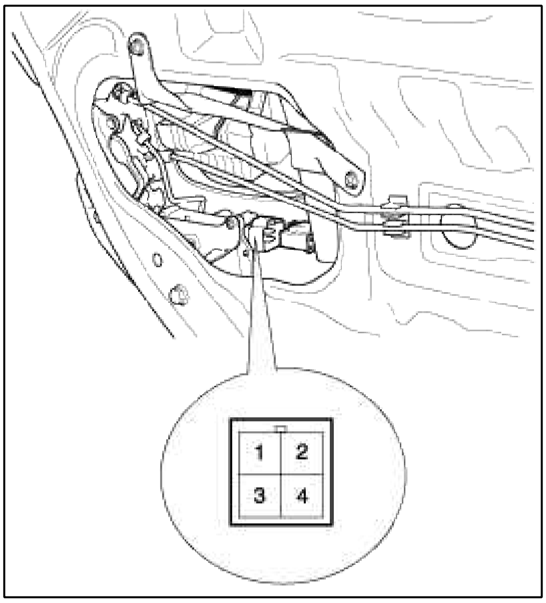
3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.



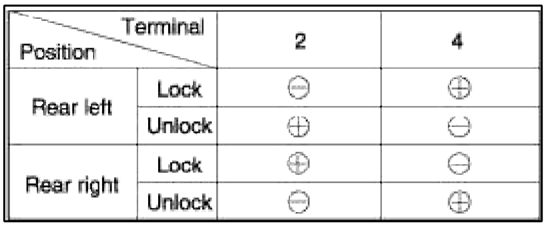
Position \ Terminal		2	4
Front left	Unlock	⊖	⊕
	Lock	⊕	⊖
Front right	Unlock	⊕	⊖
	Lock	⊖	⊕

REAR DOOR LOCK ACTUATOR INSPECTION

1. Remove the front door trim panel. (Refer to BD group-Rear door)
2. Disconnect the 4P connector from the actuator.



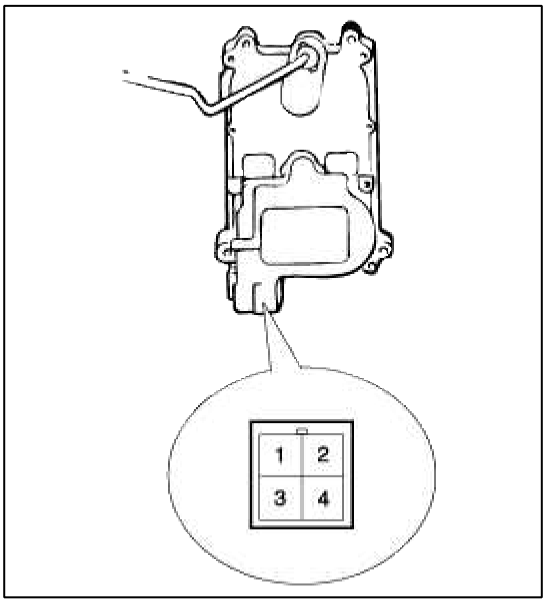
3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.



Position \ Terminal		2	4
Rear left	Lock	⊖	⊕
	Unlock	⊕	⊖
Rear right	Lock	⊕	⊖
	Unlock	⊖	⊕

FRONT DOOR LOCK SWITCH INSPECTION

1. Remove the front door trim panel. (Refer to BD group-Front door)
2. Disconnect the 4P connector from the actuator.

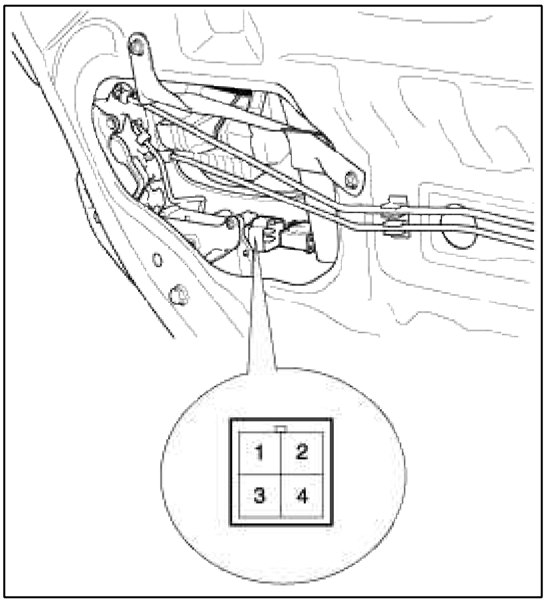


3. Check for continuity between the terminals in each switch position according to the table.

Position \ Terminal		1	3
Front left	Lock		
	Unlock	○	○
Front right	Lock		
	Unlock	○	○

REAR DOOR LOCK SWITCH INSPECTION

1. Remove the rear door trim panel. (Refer to BD group-Rear door)
2. Disconnect the 4P connector from the actuator.

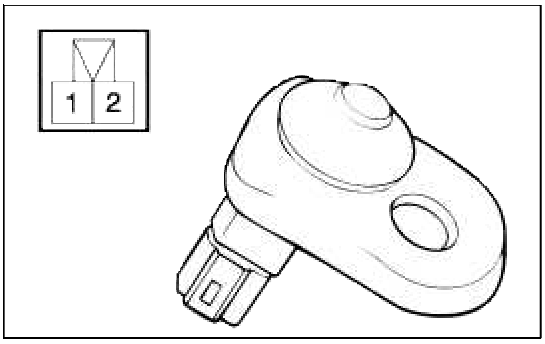


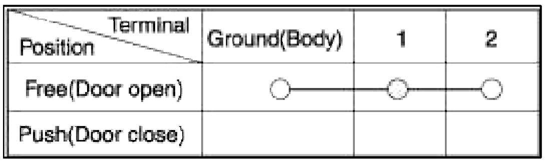
3. Check for continuity between the terminals in each switch position according to the table.

Position \ Terminal		1	3
Rear left	Lock		
	Unlock	○	○
Rear right	Lock		
	Unlock	○	○

DOOR SWITCH INSPECTION

Remove the door switch and check for continuity between the terminals.

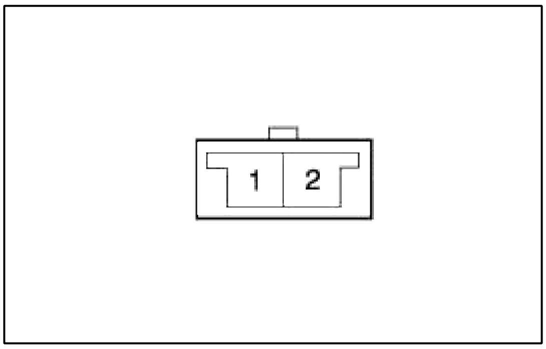




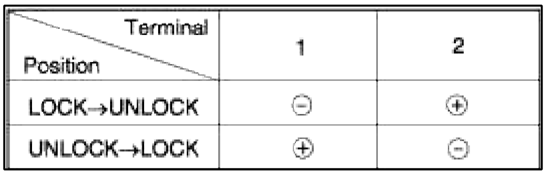
Position \ Terminal	Ground(Body)	1	2
Free(Door open)	○	○	○
Push(Door close)			

TAILGATE LOCK ACTUATOR INSPECTION (3/5 DOOR)

1. Remove the tailgate trim panel. (Refer to BD group-Tailgate)
2. Disconnect the 2P connector from the actuator.



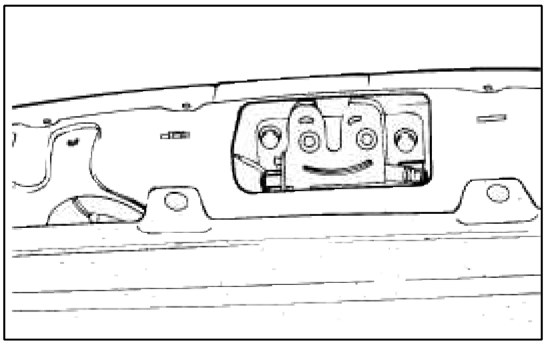
3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.



Position \ Terminal	1	2
LOCK→UNLOCK	⊖	⊕
UNLOCK→LOCK	⊕	⊖

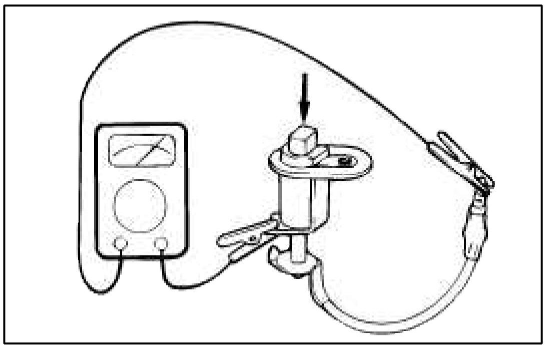
TRUNK LID SWITCH INSPECTION (4DOOR)

1. Disconnect the negative battery terminal.
2. After opening the trunk, disconnect the connector from the rear harness.



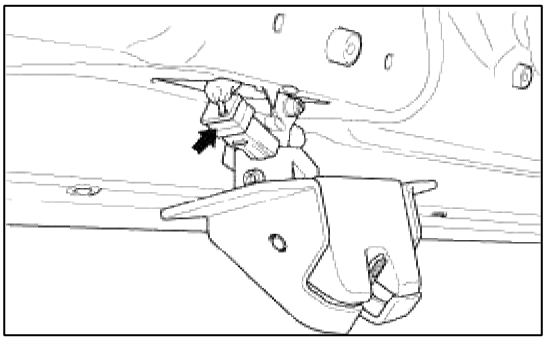
3. Check for continuity between the terminal and body while pushing the rod.

Switch rod condition	Continuity
Push (OFF)	Non-conductive (∞Ω)
Released (ON)	Conductive (0Ω)

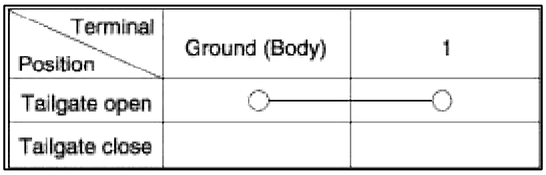


TAILGATE SWITCH INSPECTION (3/5 DOOR)

1. Remove the tailgate trim panel. (Refer to BD group-Tailgate)
2. Remove the tailgate latch after removing 3 bolts and disconnect the 1P connector from the tailgate switch.



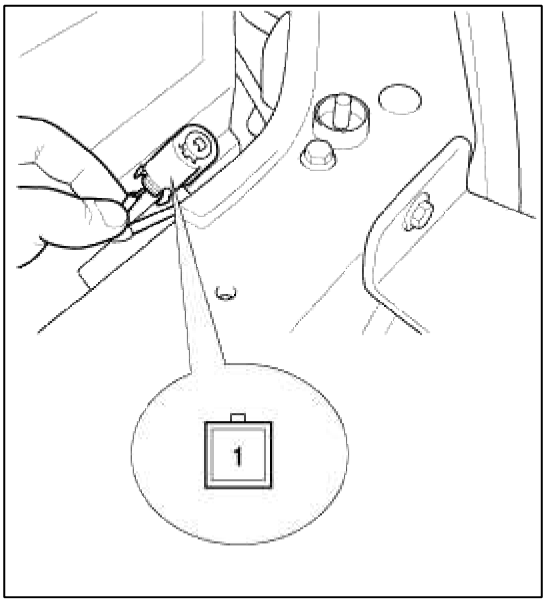
3. Check for continuity between the terminal and ground according to the table.



Terminal / Position	Ground (Body)	1
Tailgate open	○	○
Tailgate close		

HOOD SWITCH INSPECTION

1. Disconnect the 1P connector from the hood switch.

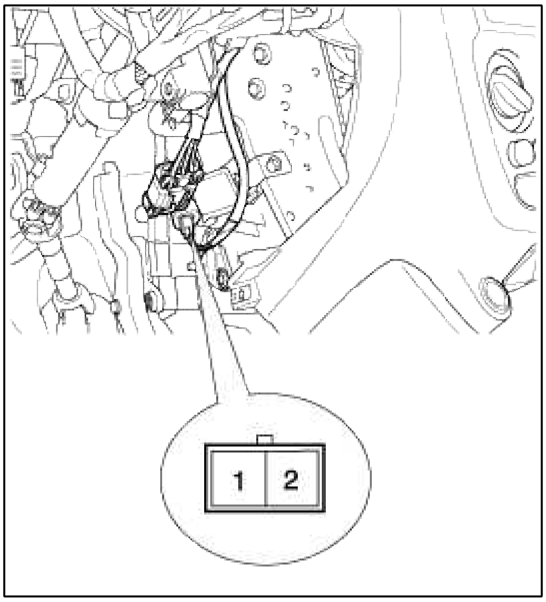


2. Check for continuity between the terminal and ground according to the table.

Position \ Terminal	Ground (Body)	1
Hood open (Free)	○	○
Hood close (Push)		

DOOR WARNING SWITCH INSPECTION

1. Remove the driver's crash pad lower panel. (Refer to BD group-Crash pad)
2. Disconnect the 2P connector from the door warning switch.

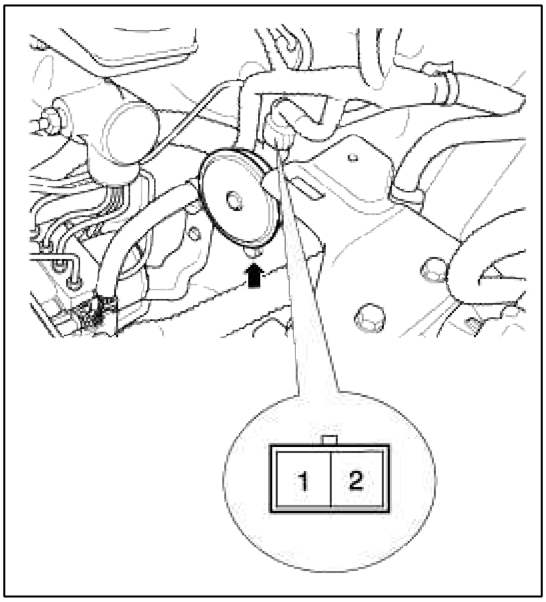


3. Check for continuity between the terminals in each position according to the table.

Key position \ Terminal	1	2
Insert	○	○
Removal		

BURGLAR ALARM HORN INSPECTION

1. Remove the horn after removing a bolt and disconnect the 2P connector from the horn.



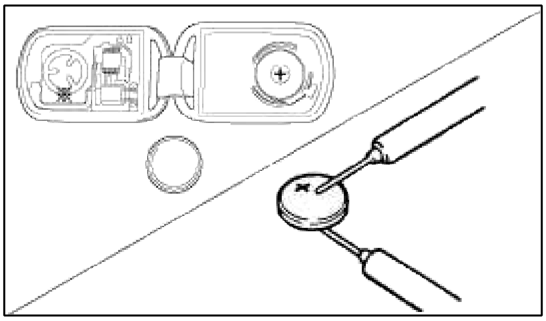
2. Test the horn by connecting battery power to terminal 1 and ground terminal 2.
   The horn should make a sound. If the horn fails to make a sound replace it.

Body Electrical System > Keyless Entry And > Transmitter > Repair procedures

INSPECTION

1. Check that the red light flickers when the door lock or unlock button is pressed on the transmitter.
2. Remove the battery and check voltage if the red light doesn't flicker.

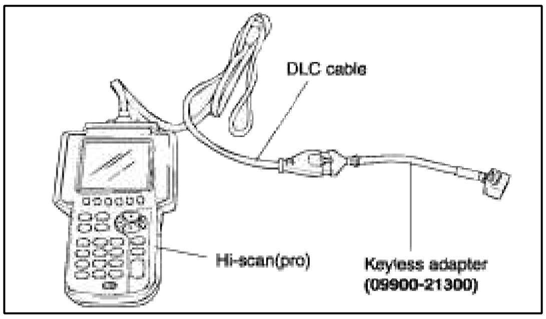
Standard voltage : 3V



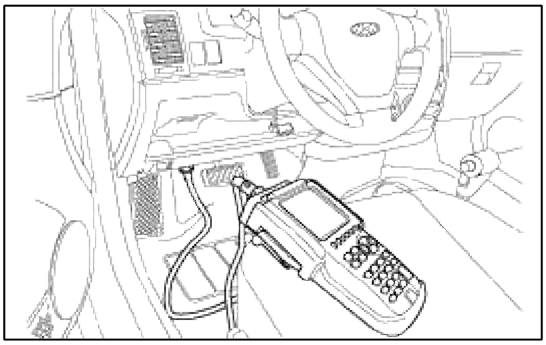
3. Replace the transmitter battery with a new one, if voltage is below 3V then try to lock and unlock the doors with the transmitter by pressing the lock or unlock button five or six times.
4. If the doors lock and unlock, the transmitter is O.K, but if the doors don't lock and unlock, register the transmitter code, then try to lock and unlock the doors (See the workshop manual page BE-29)
5. If the doors lock and unlock, the transmitter is O.K, but if the doors don't lock and unlock, replace the transmitter.

TRANSMITTER CODE REGISTRATION

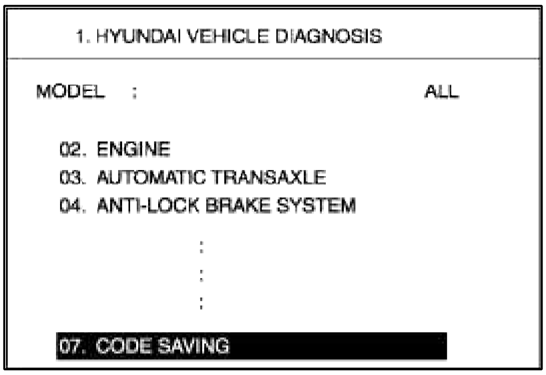
1. To register transmitter code, first connect keyless adapter (09900-21300) to DLC(Data Link Connector) cable of hi-scan as shown in the illustration.



2. After connecting keyless adapter to the multi purpose check connector (10pins) beside data link connector in driver side crash pad lower panel, turn the power on hi-scan.



3. Select the vehicle model and then do "CODE SAVING".

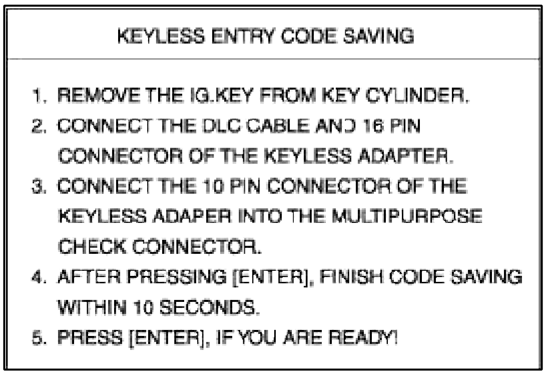


1. HYUNDAI VEHICLE DIAGNOSIS

MODEL : ALL

02. ENGINE
03. AUTOMATIC TRANSAXLE
04. ANTI-LOCK BRAKE SYSTEM
:
:
:
07. CODE SAVING

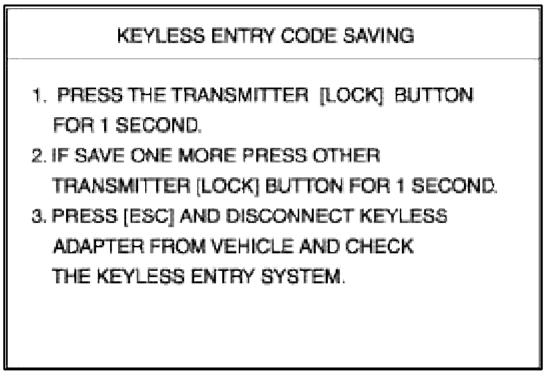
4. After selecting "CODE SAVING" menu, button "ENTER" key, then the screen will be shown as below.



KEYLESS ENTRY CODE SAVING

1. REMOVE THE IG.KEY FROM KEY CYLINDER.
2. CONNECT THE DLC CABLE AND 16 PIN CONNECTOR OF THE KEYLESS ADAPTER.
3. CONNECT THE 10 PIN CONNECTOR OF THE KEYLESS ADAPER INTO THE MULTIPURPOSE CHECK CONNECTOR.
4. AFTER PRESSING [ENTER], FINISH CODE SAVING WITHIN 10 SECONDS.
5. PRESS [ENTER], IF YOU ARE READY!

5. After removing the ignition key from key cylinder, push "ENTER" key to proceed to the next mode for code saving.



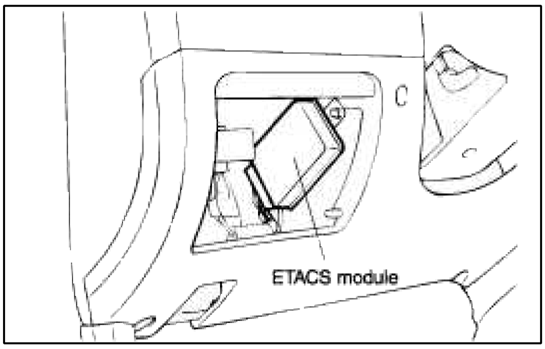
KEYLESS ENTRY CODE SAVING

1. PRESS THE TRANSMITTER [LOCK] BUTTON FOR 1 SECOND.
2. IF SAVE ONE MORE PRESS OTHER TRANSMITTER [LOCK] BUTTON FOR 1 SECOND.
3. PRESS [ESC] AND DISCONNECT KEYLESS ADAPTER FROM VEHICLE AND CHECK THE KEYLESS ENTRY SYSTEM.

6. Follow steps 1 to 3 and then code saving is completed.
7. Disconnect keyless adapter (09900-21300) from DLC cable and then proceed to self-diagnosis with DLC cable connected.

Body Electrical System > ETACS (Electronic Time > Description and Operation

DESCRIPTION

ETACS module receives various input switch signals, and controls time and alarm such as intermittent wiper timer, washer timer, rear defogger timer, seat belts warning, decayed out room lamp, central door lock, ignition key reminder, power window timer, door warning, tail lamp auto cut, crash door unlock and keyless entry & burglar alarm automatically.	

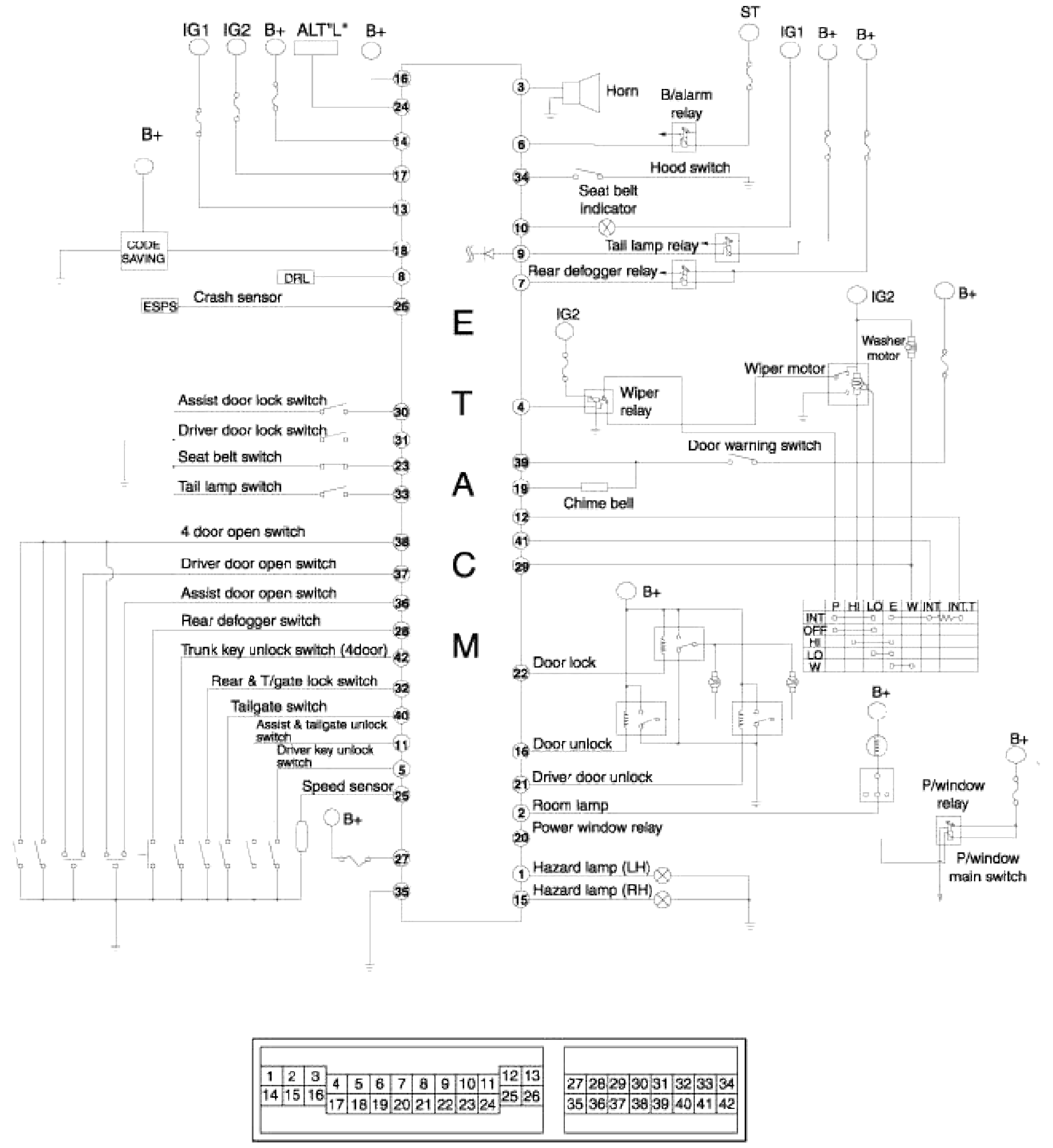
Body Electrical System > ETACS (Electronic Time > Specifications

SPECIFICATIONS

Items	Specifications
Rated voltage	DC 12V
Operating voltage	DC 9 ~ 16V
Operating temperature	-30°C ~ 80°C
Insulation resistance	100MΩ or more
Rated load Horn relay Chime bell Rear defogger relay Hazard lamp relay Tail lamp relay Seat belt warning indicator Room lamp Door lock relay Door unlock relay Burglar alarm relay	DC 12V, 200mA (Inductance load) DC 12V, 350mA (Inductance load) DC 12V, 200mA (Inductance load) DC 12V, 200mA (Inductance load) DC 12V, 200mA (Inductance load) DC 12V, 1.2W (Lamp load) DC 12V, 10W (Lamp load) DC 12V, 200mA (Inductance load) DC 12V, 200mA (Inductance load) DC 12V, 200mA (Inductance load)

Body Electrical System > ETACS (Electronic Time > ETACS Module > Schematic Diagrams

CIRCUIT DIAGRAM

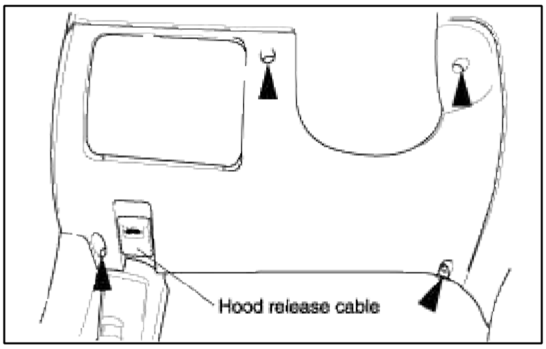

IG1
IG2
B+
ALT"L"
B+
ST
IG1
B+
B+
B+
CODE SAVING
DRL
ESPS
Crash sensor
Horn
B/alarm relay
Hood switch
Seat belt indicator
Tail lamp relay
Rear defogger relay
IG2
Wiper relay
Wiper motor
Washer motor
IG2
B+
Door warning switch
Chime bell
E
T
A
C
M
Assist door lock switch
Driver door lock switch
Seat belt switch
Tail lamp switch
4 door open switch
Driver door open switch
Assist door open switch
Rear defogger switch
Trunk key unlock switch (4door)
Rear & T/gate lock switch
Tailgate switch
Assist & tailgate unlock switch
Driver key unlock switch
Speed sensor
B+
B+
Door lock
Door unlock
Driver door unlock
Room lamp
Power window relay
Hazard lamp (LH)
Hazard lamp (RH)
B+
B+
P/window relay
P/window main switch
P
HI
LO
E
W
INT
INT.T
INT
OFF
HI
LO
W
16
24
14
17
13
18
8
26
30
31
23
33
38
37
36
28
42
32
40
11
5
25
27
35
3
6
34
10
9
7
4
39
19
12
41
29
22
16
21
2
20
1
15
1 2 3 4 5 6 7 8 9 10 11 12 13
14 15 16 17 18 19 20 21 22 23 24 25 26
27 28 29 30 31 32 33 34
35 36 37 38 39 40 41 42

Body Electrical System > ETACS (Electronic Time > ETACS Module > Repair procedures

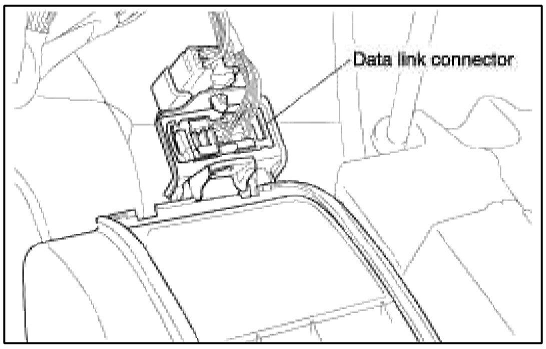
REMOVAL AND INSTALLATION

1. Disconnect the negative(-) battery terminal.

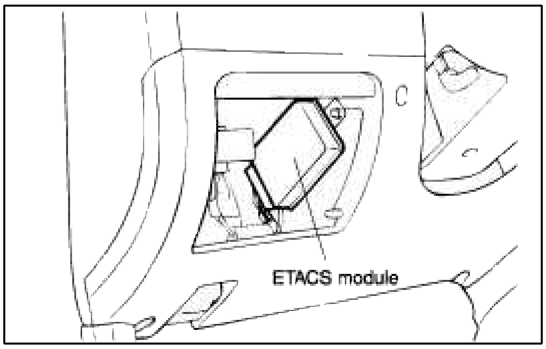
2. Remove the 2 screws and 2 bolts holding the driver's crash pad lower panel.



3. Disconnect the hood release cable and the data link connector from beneath the driver's crash pad lower panel.



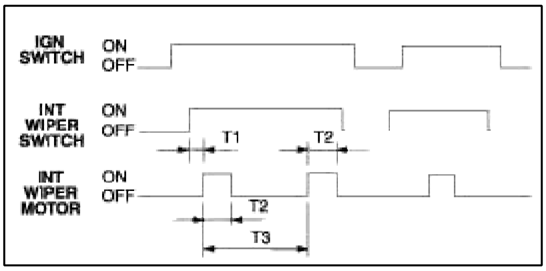
4. Remove the ETACS module from the bracket after removing bolts.



5. Installation is the reverse of removal.

INSPECTION

1. VEHICLE SPEED SENSING INTERMITTENT WIPER



Time specification

T1 : Max. 0.5sec.

T2 : 0.6~0.7 sec. (Time of wiper motor 1 rotation)

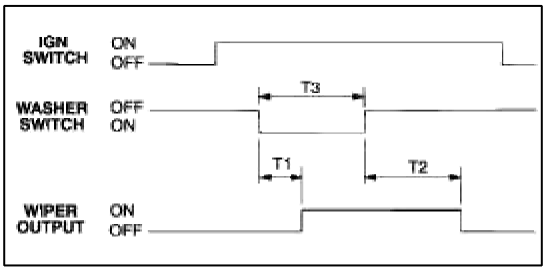
T3 : At vehicle speed : 0km/h.

2.6±0.7 sec. (VR=0kΩ)~18.0±1sec. (VR=50kΩ)

At vehicle speed = 100km/h or more.

1.0±0.2sec. (VR=0kΩ)~10.0±1 sec. (VR=50kΩ)

2. WASHER


IGN SWITCH
ON
OFF
T3
WASHER SWITCH
OFF
ON
T1
T2
WIPER OUTPUT
ON
OFF

A. Time specification
T1 : 0.3 sec.
T2 : 0.6~0.8 sec.
T3 : 0.2~0.6 sec.

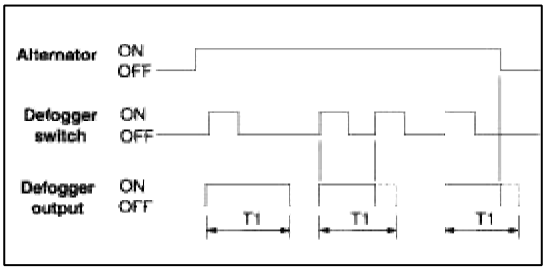
B. Time specification
T1 : 0.3 sec.
T2 : 2.5~3.8 sec.
T3 : 0.6 sec. or more

C. This function should be operated preferentially even though the variable intermittent wiper is operating.

3. DEFOGGER TIMER (Including Outside Mirror Demister)

(1) After ALT "L" ON, if the defogger is switched ON, the defogger output is ON for 20 minutes duration.

(2) If the defogger switch is pressed again, or if the ignition is switched OFF during this time, the defogger output is OFF.


Alternator
ON
OFF
Defogger switch
ON
OFF
Defogger output
ON
OFF
T1
T1
T1

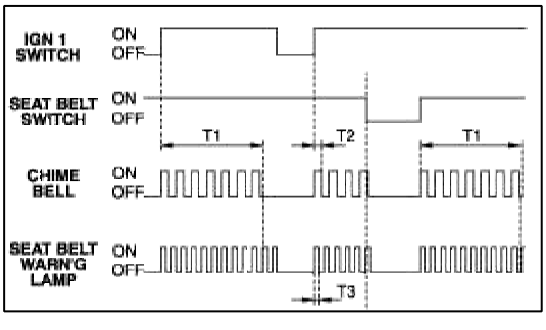
T1 : 20 ± 1min.

4. SEAT BELT WARNING TIMER

(1) Since the ignition is switched ON, the seat belt warning indicator is illuminated infinitely (with period : 0.6 sec., duty rate : 50%) and the chime bell is sounded (with period : 0.9 sec., duty rate : 50%) for total time 6 seconds.

(2) If the ignition is swithced off during the indicator and the chime bell output, the indicator and the chime bell are switched OFF.
If the seat belt is fastened during the indicator and the chime bell output, the indicator and the chime bell are switched OFF immediately.

(3) When the ignition is already switched ON, if the seat belt is not fastened, the chime bell is sounded for 6 second and the warning indicator is illuminated infinitely.


IGN 1 SWITCH
ON
OFF
SEAT BELT SWITCH
ON
OFF
T1
T2
T1
CHIME BELL
ON
OFF
SEAT BELT WARN'G LAMP
ON
OFF
T3

T1 : 6±1 sec., T2 : 0.45 ± 0.1 sec., T3 : 0.3 ± 0.1 sec.

5. DECAYED ROOM LAMP & KEYLESS UNLOCK TIMER

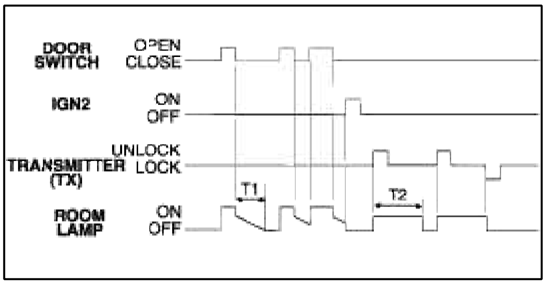
(1) When the first door (driver's or assist) is opened, the room lamp shall brighten. When the last door is closed, the room lamp will drop to 75% intensity, then fade out over 5-6 seconds.

(2) If the door switch is ON for less than 0.1 sec., then no illumination occurs.

(3) The fade resolution is over 32 steps.

(4) The room lamp must not flicker during fade operation, if the ignition is switched ON.

(5) With keyless UNLOCK, when the door is closed, the room lamp is turned ON, then OFF after about 30 seconds. While the room lamp is ON due to keyless UNLOCK, if another UNLOCK is received, the room lamp is again ON for 30 seconds.
While the room lamp is ON, If the door is opened, the lamp is continued to ON. If the door is closed, the lamp follows as the above step 1.
If keyless LOCK (ARM state) is received during fade out, the room lamp is switched off immediately.


DOOR SWITCH
OPEN
CLOSE
IGN2
ON
OFF
TRANSMITTER (TX)
UNLOCK
LOCK
T1
T2
ROOM LAMP
ON
OFF

T1 : 5.5 ± 0.5 sec., T2 : 30 ± 3 sec.

6. CENTRAL DOOR LOCK/UNLOCK

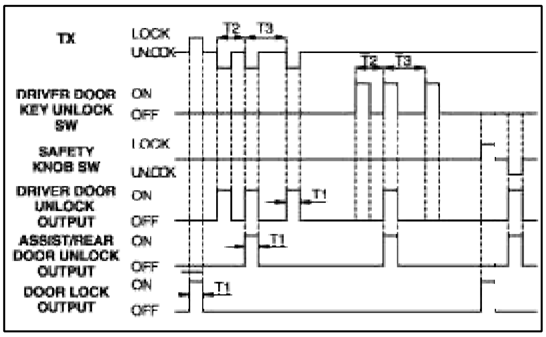
(1) If transmitter(TX) lock or key lock signal is received, all door lock output is ON.

(2) With driver door lock state, if TX unlock or key unlock signal is received, only driver door unlock output is ON.

(3) Within 4 sec. since final unlock signal, if TX unlock or key unlock signal is received again, all doors unlock output is ON at driver door unlock state.
If the time (4 sec.) elapse, only driver door unlock output is ON.

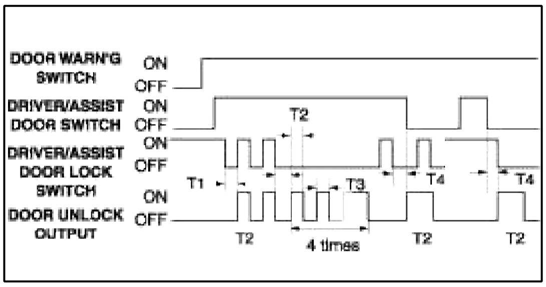
(4) Using safety knob, possible to central door lock/unlock.

(5) Door key unlock switch is applied to driver door, assist door and tailgate.


TX
LOCK
UNLOCK
T2
T3
T2
T3
DRIVER DOOR KEY UNLOCK SW
ON
OFF
SAFETY KNOB SW
LOCK
UNLOCK
DRIVER DOOR UNLOCK OUTPUT
ON
OFF
T1
ASSIST/REAR DOOR UNLOCK OUTPUT
ON
OFF
T1
DOOR LOCK OUTPUT
ON
OFF
T1

T1 : 0.5 ± 0.1 sec.
T2 : Max. 4 sec.
T3 : Min. 4 sec.

7. IGNITION KEY REMINDER


DOOR WARN'G SWITCH
ON
OFF
DRIVER/ASSIST DOOR SWITCH
ON
OFF
DRIVER/ASSIST DOOR LOCK SWITCH
ON
OFF
DOOR UNLOCK OUTPUT
ON
OFF
T1
T2
T3
T4
T4
T2
4 times
T2
T2

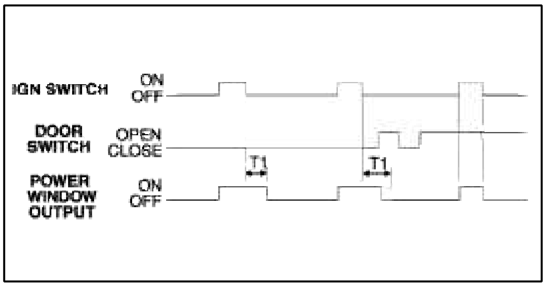
T1,T3 : 0.5 sec., T2 : 1 sec., T4 : Max.0.5 sec.

8. POWER WINDOW TIMER

(1) When the ignition is switched ON, the power window relay output is turned ON.

(2) When the ignition is switched OFF, the power window output is maintained ON for 30 seconds and then turned OFF.

(3) With the state of step 2, if the driver's door or assist door is opened, the output shall be turned OFF immediately.

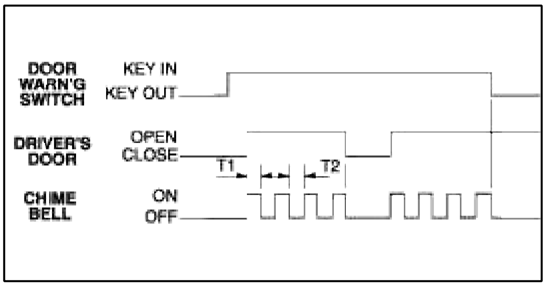

IGN SWITCH
ON
OFF
DOOR SWITCH
OPEN
CLOSE
T1
T1
POWER WINDOW OUTPUT
ON
OFF

T1 : 30 ± 3 sec.

9. DOOR OPEN WARNING

(1) If the key is in the ignition key cylinder and the driver's door is opened, the chime bell sounds continually (period:0.9 sec. Duty rate:50%).

(2) If the door is closed or the key is removed, the chime stops immediately.


DOOR WARN'G SWITCH
KEY IN
KEY OUT
DRIVER'S DOOR
OPEN
CLOSE
T1
T2
CHIME BELL
ON
OFF

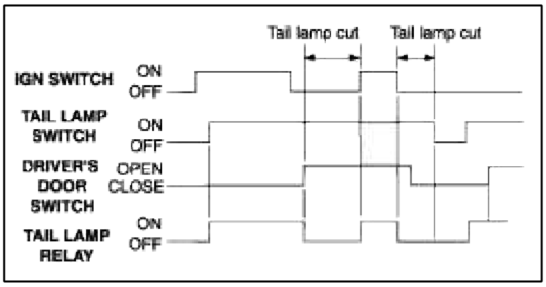
T1,T2 : 0.45 ± 0.1 sec.

10. TAIL LAMP AUTO CUT

(1) When the tail lamp is switched ON, if the ignition is switched OFF and the driver's door is opened, the tail lamp should be automatically OFF.

(2) With the ignition switched ON, if the driver's door is opened and the ignition is switched OFF, the tail lamp should be automatically OFF.

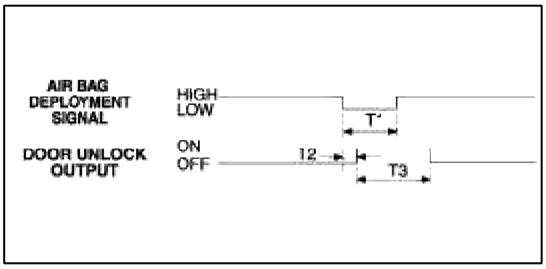
(3) When the tail lamp is cut automatically, if the tail lamp switch is turned OFF and ON, the tail lamp is illuminated and auto cut function is cancelled.


Tail lamp cut
Tail lamp cut
IGN SWITCH
ON
OFF
TAIL LAMP SWITCH
ON
OFF
DRIVER'S DOOR SWITCH
OPEN
CLOSE
TAIL LAMP RELAY
ON
OFF

11. CRASH DOOR UNLOCK

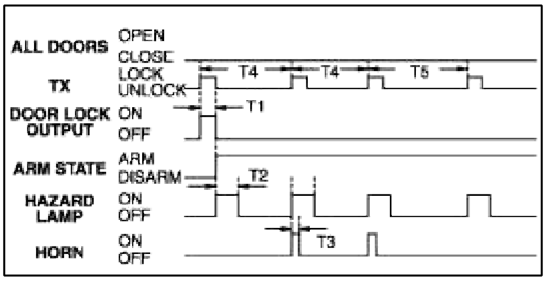
(1) With the ignition turned ON, if the air bag is deployed, a crash signal is received and send an UNLOCK output to all doors UNLOCK.

(2) After UNLOCK output, when LOCK is set, UNLOCK pulse is output for 5 second period again.


AIR BAG DEPLOYMENT SIGNAL
HIGH
LOW
T1
DOOR UNLOCK OUTPUT
ON
OFF
T2
T3

T1 : 200 msec.
T2 : 40 msec.
T3 : 5±0.5sec.

12. TX LOCK TWO TIMES FUNCTION


ALL DOORS
OPEN
CLOSE
TX
LOCK
UNLOCK
T4
T4
T5
DOOR LOCK OUTPUT
ON
OFF
T1
ARM STATE
ARM
DISARM
T2
HAZARD LAMP
ON
OFF
HORN
ON
OFF
T3

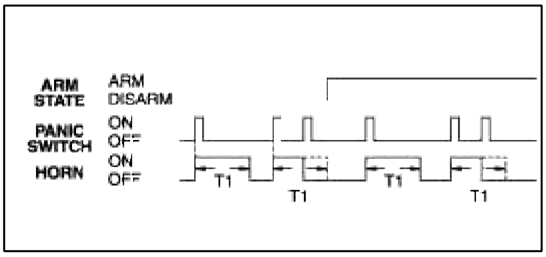
T1 : 0.5 ± 0.1 sec.
T2 : 1 ± 0.2 sec.
T3 : 0.05 sec.
T4 : Max. 4 sec.
T5 : Min. 4 sec.

13. PANIC ALARM

(1) If panic switch is ON, horn output keeps ON for 30 sec and if panic switch is ON again, horn output is OFF.

(2) Panic mode is not affected at arm or disarm state.

(3) While panic is operating, arm or disarm function operates.


ARM STATE
ARM
DISARM
PANIC SWITCH
ON
OFF
HORN
ON
OFF
T1
T1
T1
T1

T1 : 30 ± 1 sec.

ANTI-THEFT FUNCTION

1. **ARM FUNCTION**

Pressing the remote key lock button will result in a 0.5-second pulse issued to lock all doors.

Pressing the remote keypad unlock button once will result in a 0.5-second unlock pulse issued to unlock all doors.

As part of the arming sequence the alarm first enters a pre-armed state before falling into the armed state. During this pre-armed state alarm triggers are ignored. Pre-armed state can be reached from the alarmed state, the start inhibit state or the disarmed state. Pre-Arming of the alarm can be achieved by a press of the lock button on the remote key.

In the pre-armed state the visible and audible warnings are disabled.

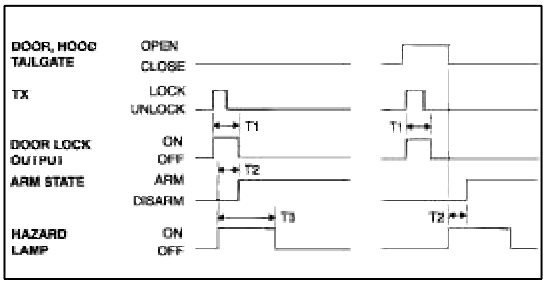
This system enters the armed state if it is in the pre-armed state and, after 0.6 sec, check actuator lock and each door, hood and tail gate close, and no door warning switch (no key in ignition).

On entering the arm state, a single flash of the hazard lamps is given, period of cycle 2 second, duty rate 50%.

If TX lock signal is received when a door, tail gate or hood is open, then lock output is given and a flash of hazard is not given.

After the armed state is entered, if a lock signal is received then a single flash of the hazard lamps is given, period of cycle 2 second, duty rate 50%.

The armed state cannot be reached by locking the car with the keys.


DOOR, HOOD TAILGATE
OPEN
CLOSE
TX
LOCK
UNLOCK
T1
T1
DOOR LOCK OUTPUT
ON
OFF
T2
ARM STATE
ARM
DISARM
T3
T2
HAZARD LAMP
ON
OFF

Time specification

T1 : 0.5 sec.

T2 : Max. 2 sec.

T3 : 1.0 ± 0.2 sec.

2. **DISARM FUNCTION**

Disarming can be performed while the alarm is armed, or alarming, or after alarming. The alarm can be disarmed by the following methods :

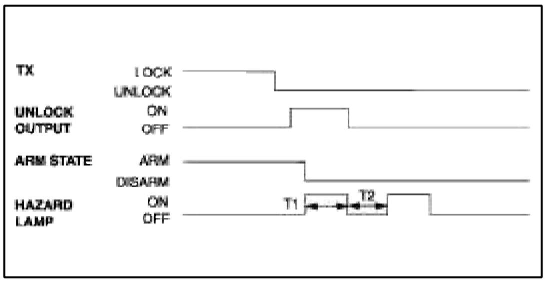
A. Pressing the unlock button on the TX key. The hazard lamps shall be flashed twice for 1sec period (of cycle), 50% duty rate.

B. If door warning switch is on, IGN1 and IGN2 are on in arm state, then arm state should be immediately cancelled. This means that the driver is inside the vehicle before pushing TX lock, so system should not arm.

In the disarm state the visible and audible warnings are disabled and start is enabled.

In the disarm state, if TX key unlock command is received, then the hazard lamps shall be flashed twice for period of cycle 1 sec, 50% duty rate.

Disarm state cannot be reached using the door locks by key.



Time specification

T1, T2 : 0.5 ± 0.1 sec.

3. **ALARM FUNCTION**

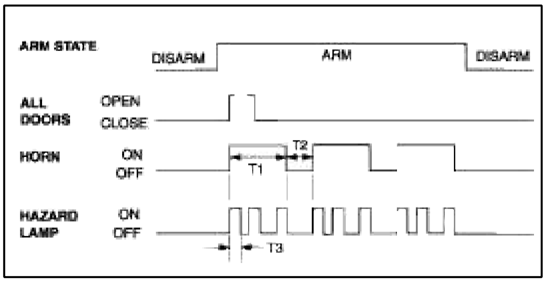
Once armed, should any door, hood or the tailgate be opened, then.

A. Start relay drive output is disabled, so starting is inhibited

B. Audible (horn) and visual (hazard lamp) warnings are issued, for three cycles, each cycle 27±2 sec. duration on, 10±1 sec. off. The horn warning is continuously occurring during the on period. The hazard lamps operate with 1 sec period, 50 % duty rate during the on period

(1) The alarm is given in the case where a door is opened with a key.

After this time, the system maintains the start inhibit state, where no audible and visual warnings are issued but engine starting is not possible.



Time specification

T1 : 27 ± 2 sec.

T2 : 10 ± 1sec.

T3 : 0.4~0.5 sec.

4. **OPERATION DURING ALARM CONDITIONS**

(1) Cancelling audible alarm with the remote transmitter

CASE 1 : Door closed

During or after alarming and then closing all doors and a TX lock signal is received Then

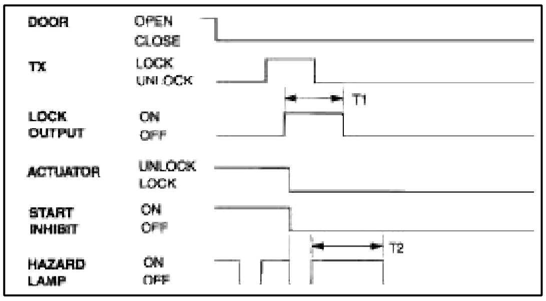
A. The lock command is executed with 0.5 sec. ON

B. Horn and start inhibition are OFF

C. Hazard lamp is flashed one time (period : 2 sec., duty: 50%, within 2 sec.)

D. The state goes to arming mode (after a lock state check)

E. The start is enabled


DOOR
OPEN
CLOSE
TX
LOCK
UNLOCK
T1
LOCK OUTPUT
ON
OFF
ACTUATOR
UNLOCK
LOCK
START INHIBIT
ON
OFF
T2
HAZARD LAMP
ON
OFF

Time specification

T1 : 0.5 sec.

T2 : 1.0 ± 0.2 sec.

CASE 2 : Door Open

During or after alarming, with a door open and a TX lock signal is received Then

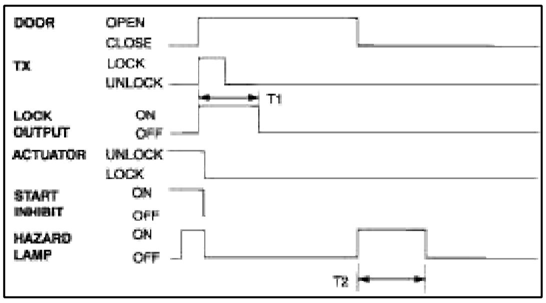
A. The lock command is executed with 0.5 sec. ON

B. Horn is disabled and start is enabled after confirmation of actuator lock

At this time, when the door is closed,

A. Hazard lamp is flashed one time (period : 2 sec., duty 50%)

B. The state goes to arming mode


DOOR
OPEN
CLOSE
TX
LOCK
UNLOCK
T1
LOCK OUTPUT
ON
OFF
ACTUATOR
UNLOCK
LOCK
START INHIBIT
ON
OFF
HAZARD LAMP
ON
OFF
T2

Time specification

T1 : 0.5 sec.

T2 : 1.0 ± 0.2 sec.

(2) New alarm conditions

Second alarm condition during alarming.

When another alarm occurs during alarming, the starting is disabled, and the alarm continues to sound for the remained time of warning signal. The alarm continues to sound after the second alarm condition is removed.

New alarm condition occurs after alarming (with all entrances closed)

If any entrance is opened again then

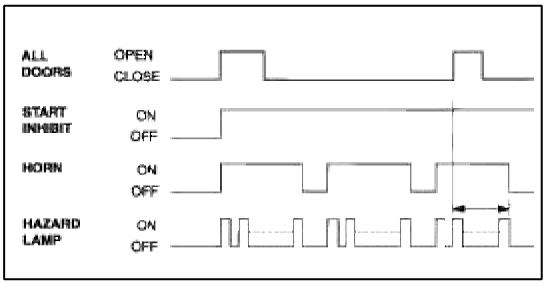
A. The horn is ON 3 times

B. Start is disabled

C. Hazard lamps flash during the ON time of horn

New alarm condition occur after alarming (with any entrance open).

If another entrance is opened, the ETACS module keeps start disabled and there is no horn output.


ALL DOORS
OPEN
CLOSE
START INHIBIT
ON
OFF
HORN
ON
OFF
HAZARD LAMP
ON
OFF

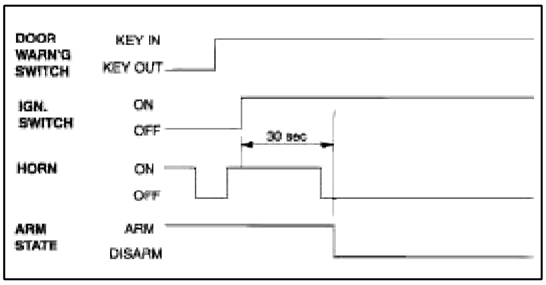
(3) Key operation during alarm

After the alarm state or start inhibit state are entered, if door warning switch on (key in ignition) &IGN 2 ON, if IGN 2 state is changed to OFF within 30sec, remain in alarm state.

(4) Disarming using the key

During alarming, in case that door warning switch (key in) is ON and then IGN1 and IGN2 are both ON for 30 sec continuously, the alarm is cancelled, and the system enters the disarm state.

After alarming, in case that door warning switch (key in) is ON and then IGN1 and IGN2 are both ON for 30 sec continuously, the alarm is cancelled, and the system enters the disarm state.


DOOR WARN'G SWITCH
KEY IN
KEY OUT
IGN. SWITCH
ON
OFF
30 sec
HORN
ON
OFF
ARM STATE
ARM
DISARM

5. **ALARM STATE IN POWER DOWN**

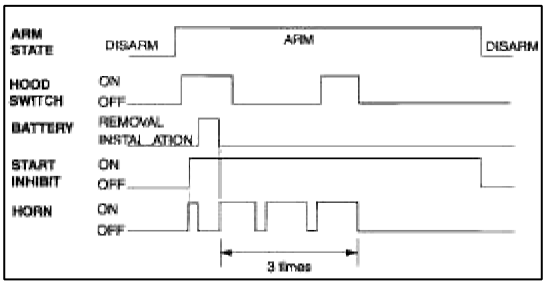
If the battery is disconnected to the ETACS module in the following states:

A. Alarm

B. After alarming

Upon restoring the battery, the alarm state shall be entered and the alarm cycle shall restarted (timer reset to 0).

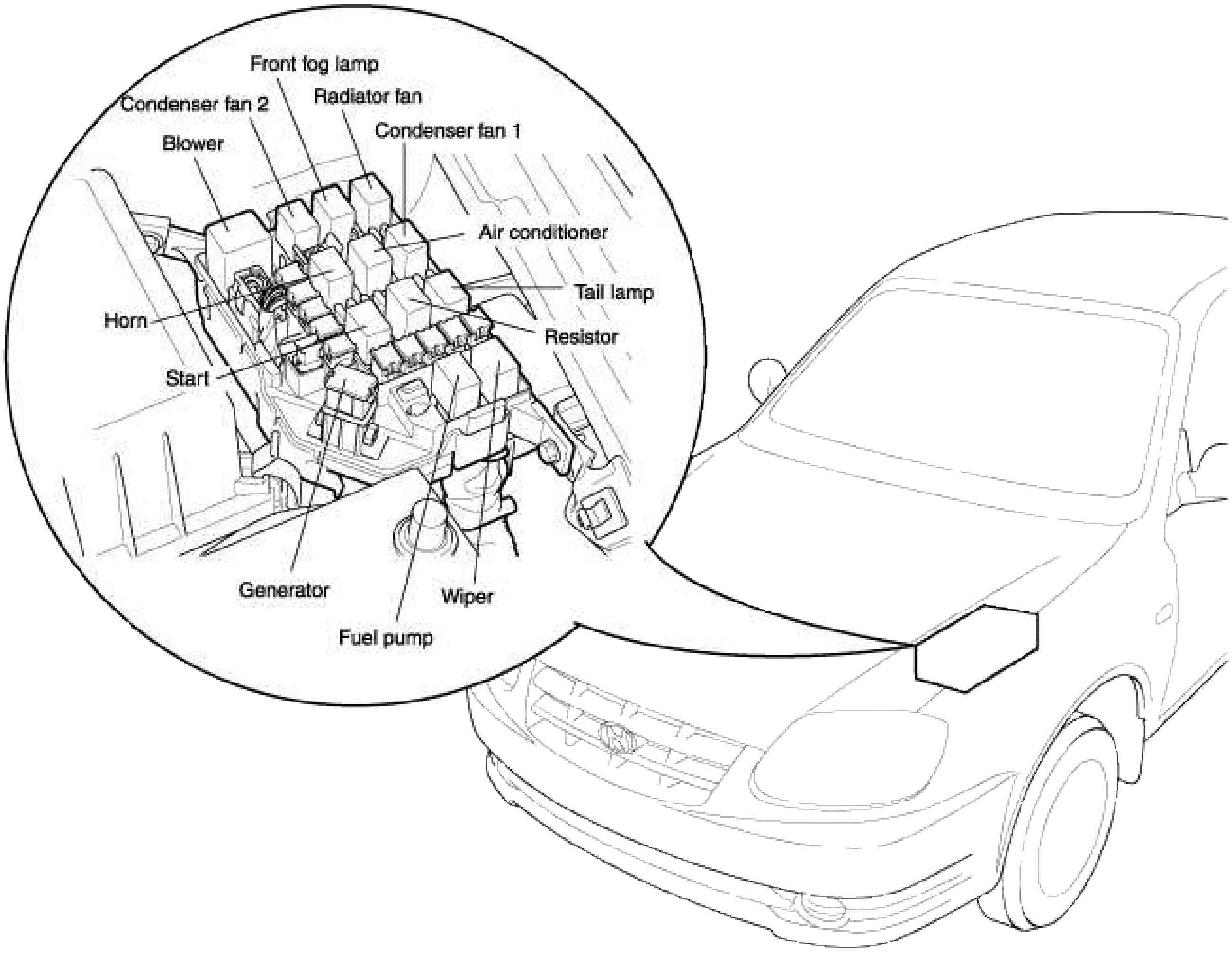
Upon restoring the battery, the alarm state shall be entered and the alarm cycle shall restart (timer reset to 0).


ARM STATE
DISARM
ARM
DISARM
HOOD SWITCH
ON
OFF
BATTERY
REMOVAL
INSTALLATION
START INHIBIT
ON
OFF
HORN
ON
OFF
3 times

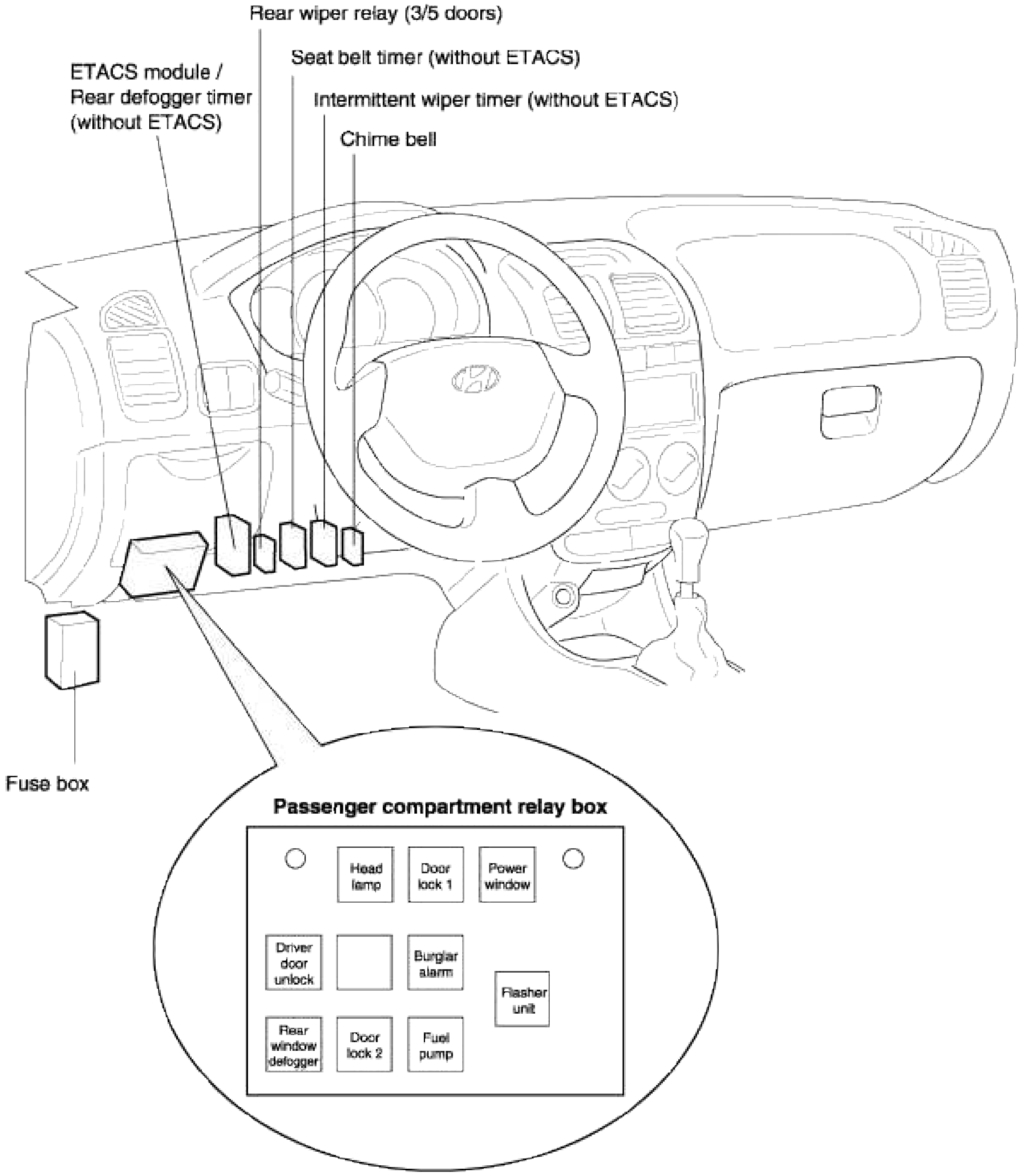
Body Electrical System > Fuses And Relays > Components and Components Location

COMPONENTS

[ENGINE COMPARTMENT RELAY BOX]

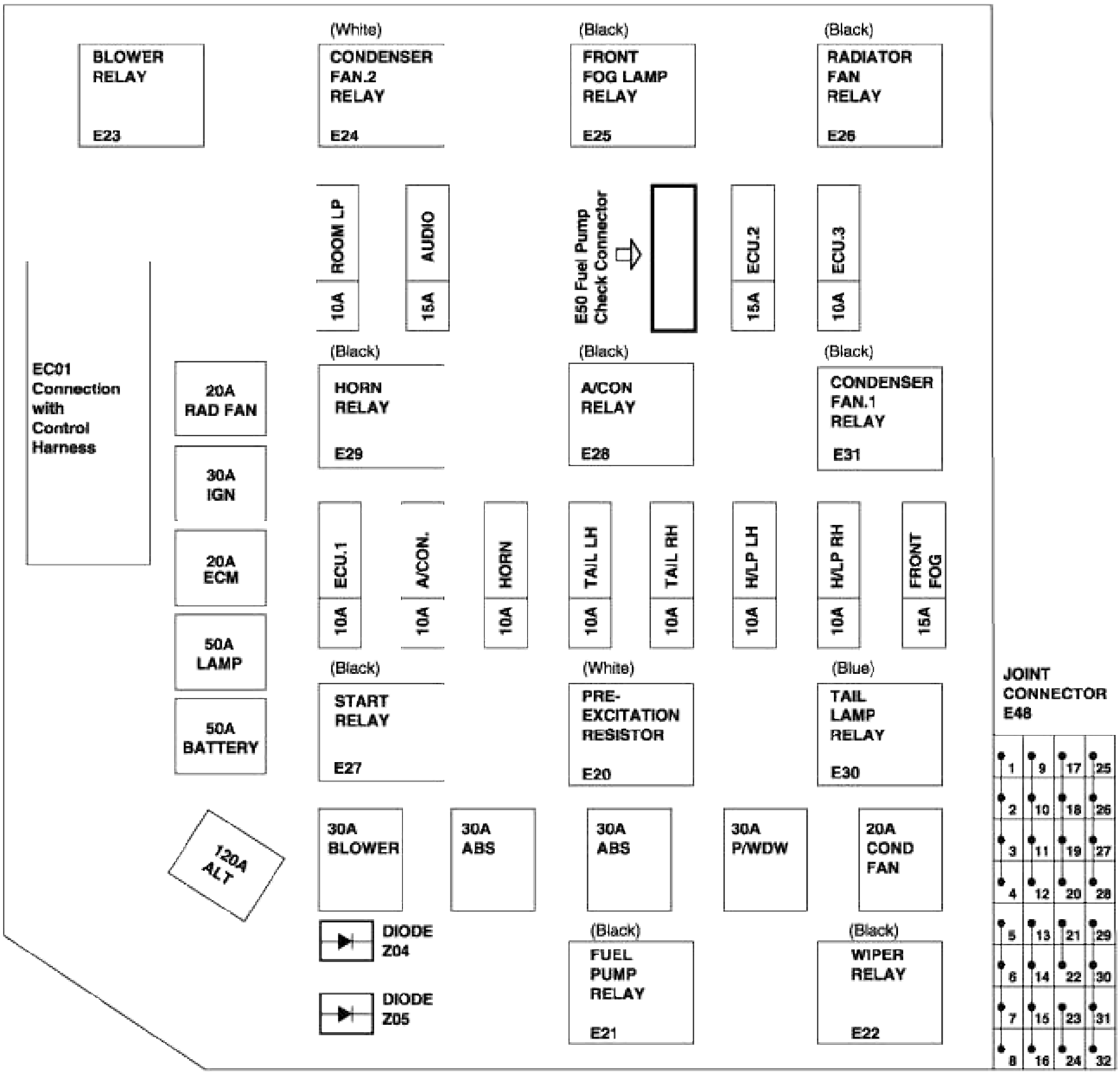

Front fog lamp
Condenser fan 2
Radiator fan
Blower
Condenser fan 1
Air conditioner
Tail lamp
Horn
Resistor
Start
Generator
Wiper
Fuel pump

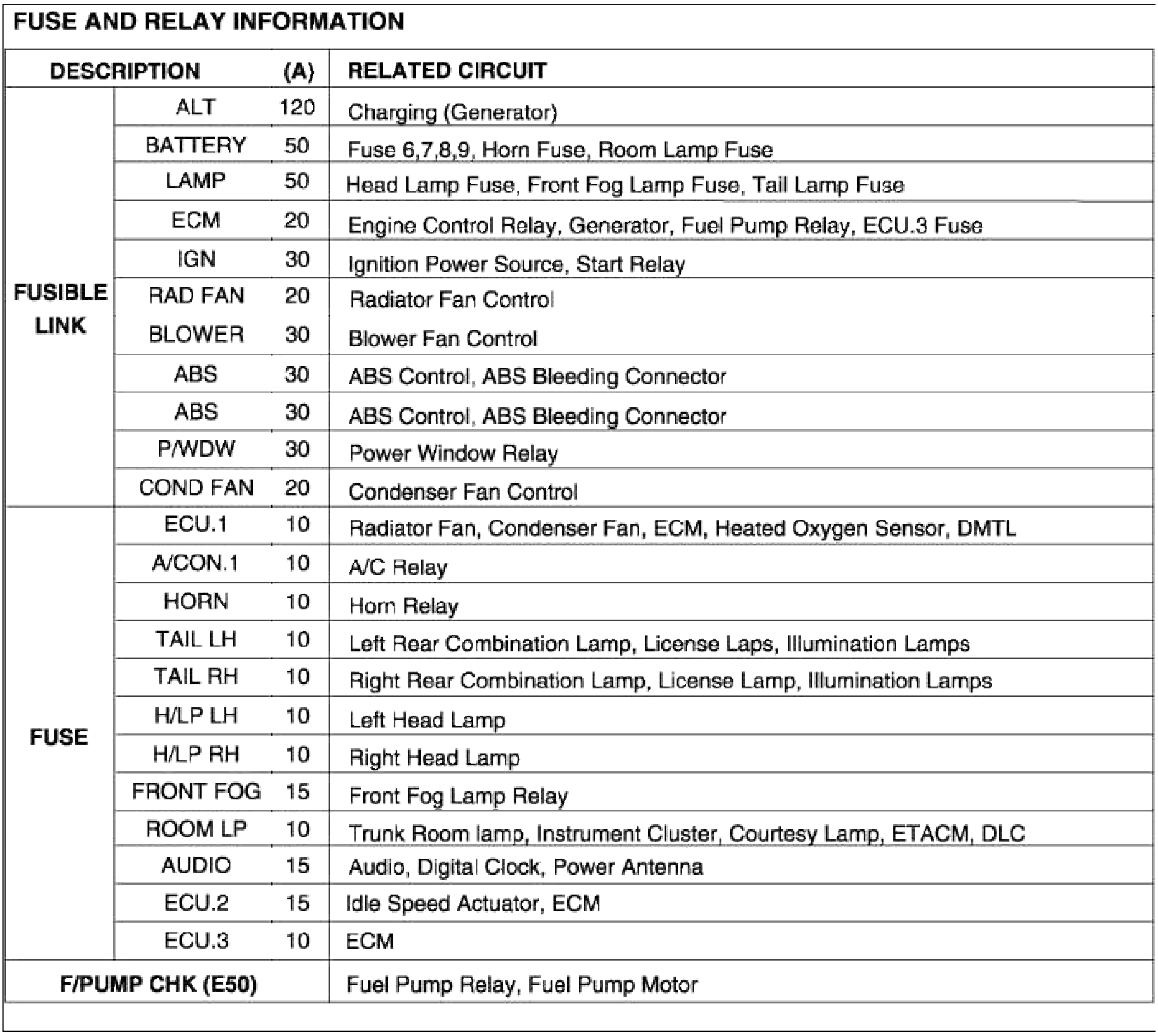
[PASSENGER COMPARTMENT RELAY BOX]


Rear wiper relay (3/5 doors)
Seat belt timer (without ETACS)
ETACS module / Rear defogger timer (without ETACS)
Intermittent wiper timer (without ETACS)
Chime bell
Fuse box
Passenger compartment relay box
Head lamp
Door lock 1
Power window
Driver door unlock
Burglar alarm
Flasher unit
Rear window defogger
Door lock 2
Fuel pump

Body Electrical System > Fuses And Relays > Relay Box (Engine Compartment) > Components and Components Location

COMPONENTS


BLOWER RELAY E23
(White) CONDENSER FAN.2 RELAY E24
(Black) FRONT FOG LAMP RELAY E25
(Black) RADIATOR FAN RELAY E26
ROOM LP 10A
AUDIO 15A
E50 Fuel Pump Check Connector
ECU.2 15A
ECU.3 10A
EC01 Connection with Control Harness
20A RAD FAN
30A IGN
20A ECM
50A LAMP
50A BATTERY
120A ALT
(Black) HORN RELAY E29
(Black) A/CON RELAY E28
(Black) CONDENSER FAN.1 RELAY E31
ECU.1 10A
A/CON. 10A
HORN 10A
TAIL LH 10A
TAIL RH 10A
H/LP LH 10A
H/LP RH 10A
FRONT FOG 15A
(Black) START RELAY E27
(White) PRE-EXCITATION RESISTOR E20
(Blue) TAIL LAMP RELAY E30
JOINT CONNECTOR E48
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24
25 26 27 28 29 30 31 32
30A BLOWER
30A ABS
30A ABS
30A P/WDW
20A COND FAN
DIODE Z04
DIODE Z05
(Black) FUEL PUMP RELAY E21
(Black) WIPER RELAY E22



FUSE AND RELAY INFORMATION

DESCRIPTION		(A)	RELATED CIRCUIT
FUSIBLE LINK	ALT	120	Charging (Generator)
	BATTERY	50	Fuse 6,7,8,9, Horn Fuse, Room Lamp Fuse
	LAMP	50	Head Lamp Fuse, Front Fog Lamp Fuse, Tail Lamp Fuse
	ECM	20	Engine Control Relay, Generator, Fuel Pump Relay, ECU.3 Fuse
	IGN	30	Ignition Power Source, Start Relay
	RAD FAN	20	Radiator Fan Control
	BLOWER	30	Blower Fan Control
	ABS	30	ABS Control, ABS Bleeding Connector
	ABS	30	ABS Control, ABS Bleeding Connector
	P/WDW	30	Power Window Relay
	COND FAN	20	Condenser Fan Control
FUSE	ECU.1	10	Radiator Fan, Condenser Fan, ECM, Heated Oxygen Sensor, DMTL
	A/CON.1	10	A/C Relay
	HORN	10	Horn Relay
	TAIL LH	10	Left Rear Combination Lamp, License Laps, Illumination Lamps
	TAIL RH	10	Right Rear Combination Lamp, License Lamp, Illumination Lamps
	H/LP LH	10	Left Head Lamp
	H/LP RH	10	Right Head Lamp
	FRONT FOG	15	Front Fog Lamp Relay
	ROOM LP	10	Trunk Room lamp, Instrument Cluster, Courtesy Lamp, ETACM, DLC
	AUDIO	15	Audio, Digital Clock, Power Antenna
	ECU.2	15	Idle Speed Actuator, ECM
	ECU.3	10	ECM
F/PUMP CHK (E50)			Fuel Pump Relay, Fuel Pump Motor

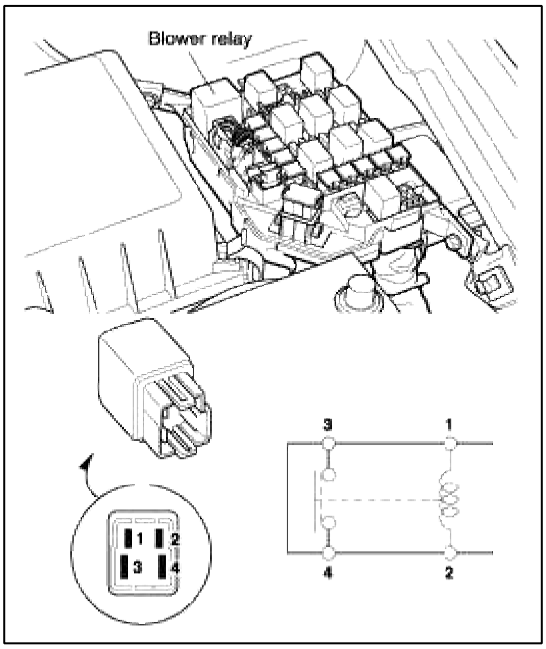
Body Electrical System > Fuses And Relays > Relay Box (Engine Compartment) > Repair procedures

INSPECTION

POWER RELAY TEST (TYPE A)

1. There should be continuity between the No.3 and No.4 terminals when power and ground are connected to the No.1 and No.2 terminals.

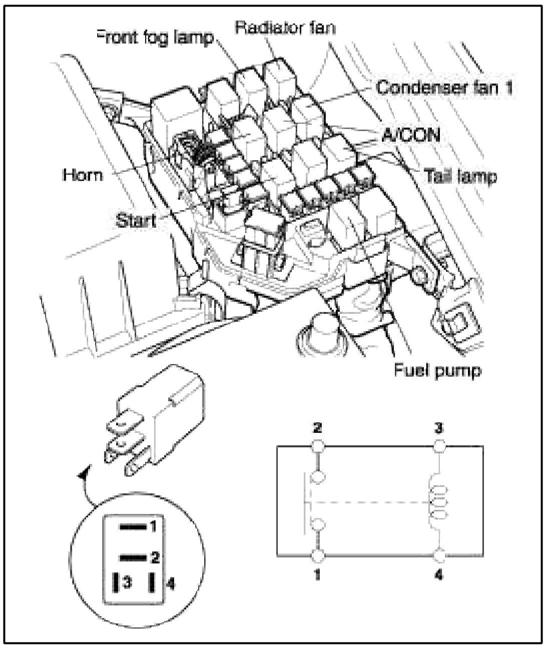
2. There should be no continuity between the No.3 and No.4 terminals when power is disconnected.


Blower relay
3
1
4
2
1
2
3
4

Terminal / Power (No.1-No.2)	1	2	3	4
Disconnected	○	○		
Connected	⊖	⊕	○	○

POWER RELAY TEST (TYPE B)

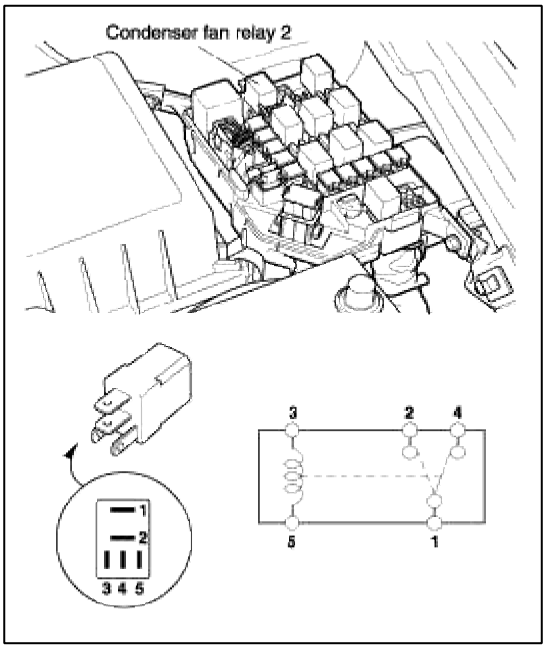
1. There should be continuity between the No.1 and No.2 terminals when power and ground are connected to the No.4 and No.3 terminals.
2. There should be no continuity between the No.1 and No.2 terminals when power is disconnected.

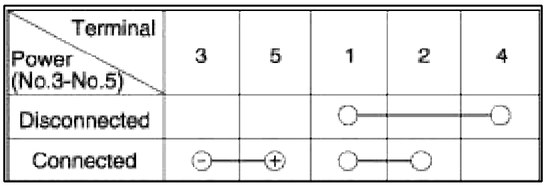

Front fog lamp
Radiator fan
Condenser fan 1
A/CON
Horn
Tail lamp
Start
Fuel pump
2
3
1
4
1
2
3
4

Terminal / Power (No.3-No.4)	1	2	3	4
Disconnected			○	○
Connected	○	○	⊖	⊕

POWER RELAY TEST (TYPE C)

1. There should be continuity between the No.1 and No.2 terminals when power and ground are connected to the No.3 and No.5 terminals.
2. There should be continuity between the No.1 and No.4 terminals when power is disconnected.





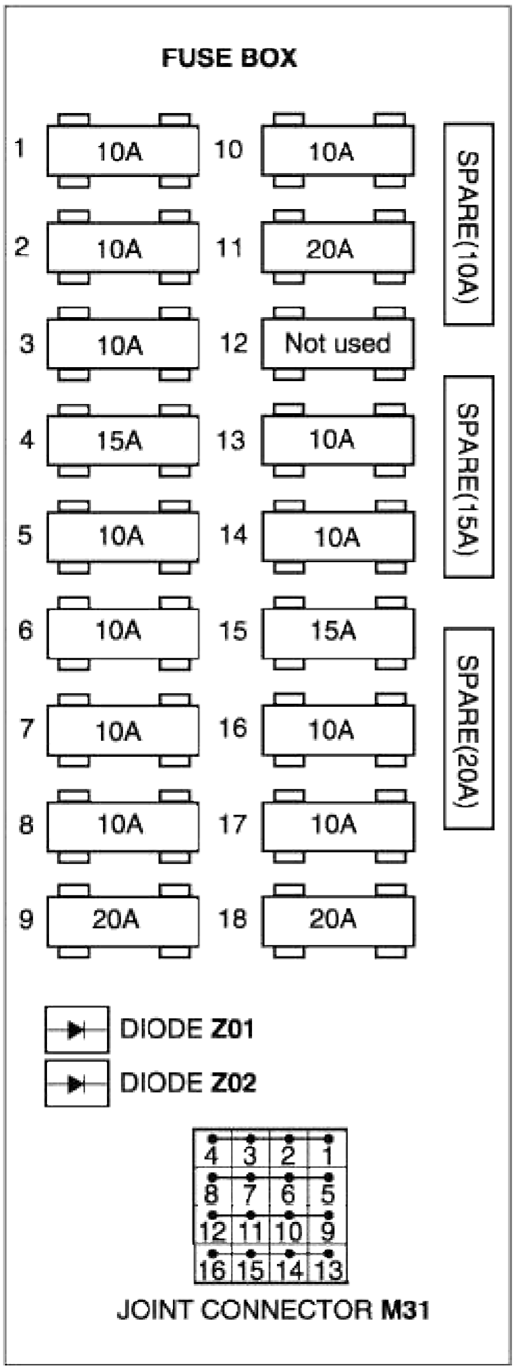
Terminal / Power (No.3-No.5)	3	5	1	2	4
Disconnected			○	─	○
Connected	⊖	⊕	○	○	

Body Electrical System > Fuses And Relays > Relay Box (Passenger Compartment) > Components and Components Location

COMPONENTS

[DASH FUSE BOX]

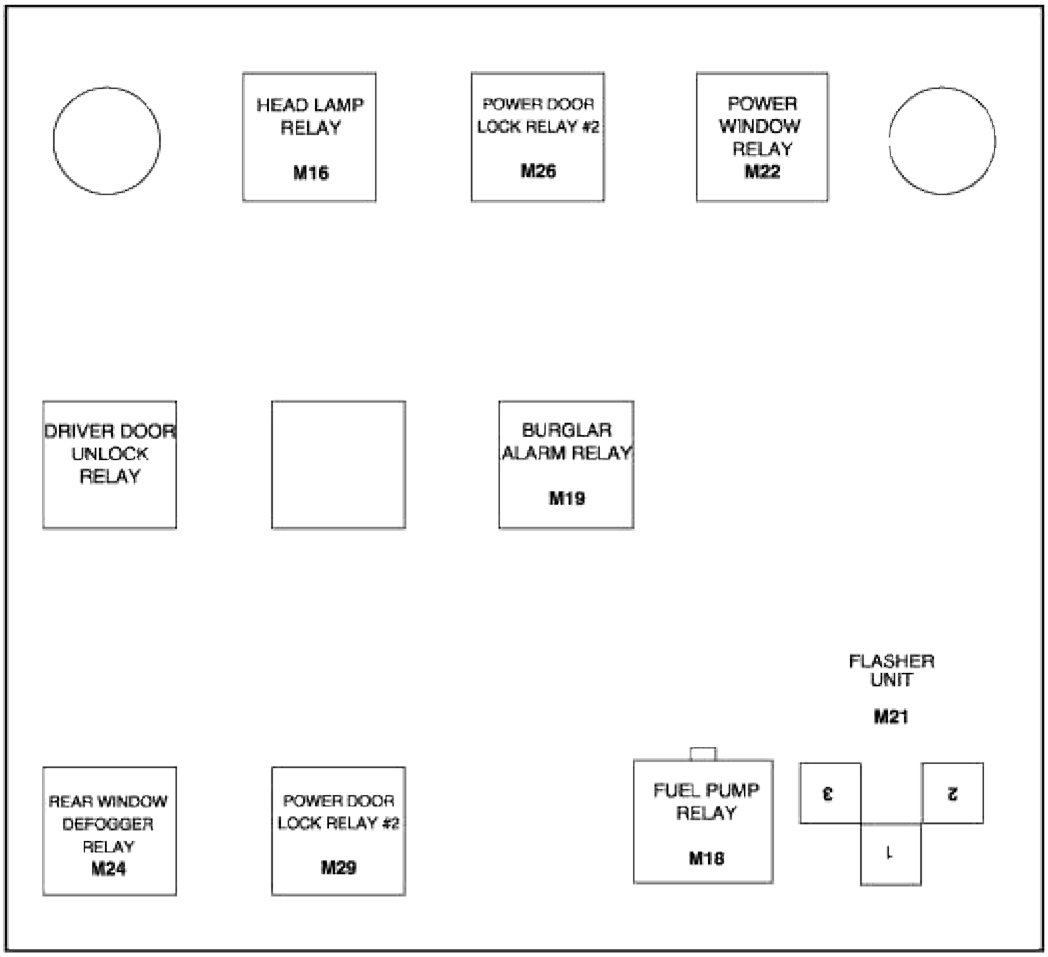
LAYOUT


FUSE BOX
1
10A
10
10A
2
10A
11
20A
3
10A
12
Not used
4
15A
13
10A
5
10A
14
10A
6
10A
15
15A
7
10A
16
10A
8
10A
17
10A
9
20A
18
20A
SPARE(10A)
SPARE(15A)
SPARE(20A)
DIODE **Z01**
DIODE **Z02**
4 3 2 1
8 7 6 5
12 11 10 9
16 15 14 13
JOINT CONNECTOR **M31**

CIRCUIT

FUSE	AMPERAGES	RELATED CIRCUIT
1	10A	Hazard Warning, Back-up Lamp Switch, A/T Shift & Key Lock Control Module
2	10A	ETACM, Generator Resistor, Instrument Cluster
3	10A	Instrument Cluster
4	15A	Air Bag
5	10A	ECM, TCM, A/T Shift Lever
6	10A	Power Door Lock
7	10A	Hazard Warning, ETACM
8	10A	Stop Lamp, A/T Shift Lever, A/T Key Interlock Solenoid
9	20A	Rear Window Defogger
10	10A	Head Lamp, Power Window, ETACM, Front Fog Lamp, Blower Control, Wiper
11	20A	Front Wiper & Washer
12		(Not used)
13	10A	ABS Control, ABS Bleeding
14	10A	Clock, Audio
15	15A	Cigarette Lighter
16	10A	Power Door Mirror Switch
17	10A	Power Door Mirror Motor & Defogger
18	20A	Rear Wiper

[PASSENGER COMPARTMENT RELAY BOX]


HEAD LAMP RELAY
M16
POWER DOOR LOCK RELAY #2
M26
POWER WINDOW RELAY
M22
DRIVER DOOR UNLOCK RELAY
BURGLAR ALARM RELAY
M19
FLASHER UNIT
M21
REAR WINDOW DEFOGGER RELAY
M24
POWER DOOR LOCK RELAY #2
M29
FUEL PUMP RELAY
M18
3
2
1

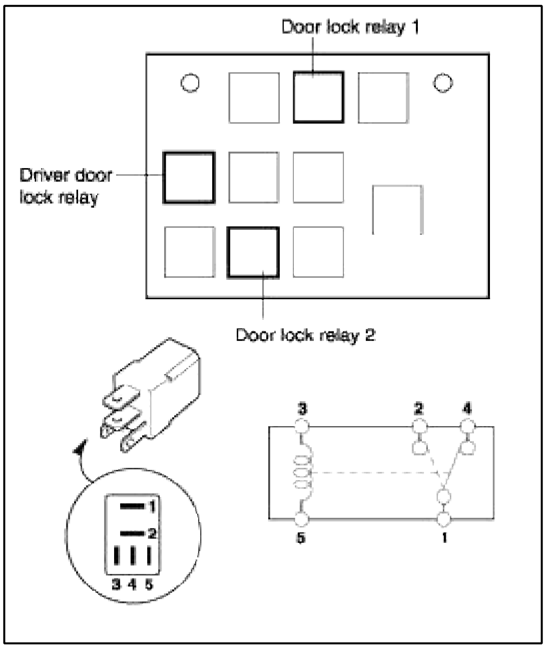
Body Electrical System > Fuses And Relays > Relay Box (Passenger Compartment) > Repair procedures

INSPECTION

POWER RELAY TEST (TYPE A)

1. There should be continuity between the No.1 and No.2 terminals when power and ground are connected to the No.3 and No.5 terminals.

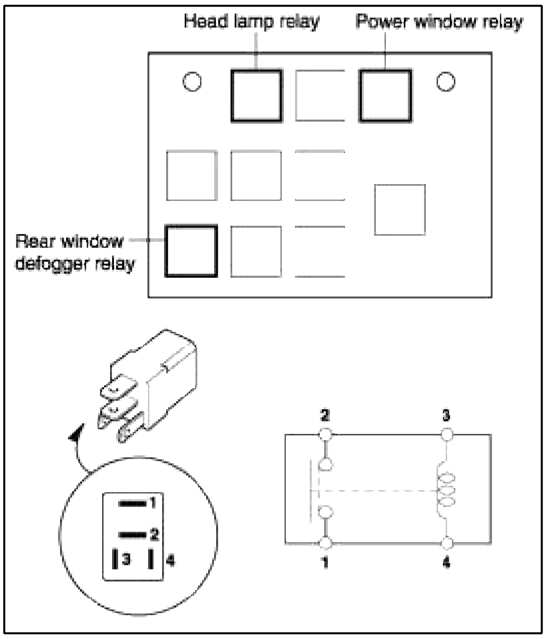
2. There should be continuity between the No.1 and No.4 terminals when power is disconnected.


Door lock relay 1
Driver door lock relay
Door lock relay 2
3
2
4
5
1
1
2
3 4 5

Terminal / Position	3	5	1	2	4
Disconnected			○	—	○
Connected	⊖	⊕	○	○	

POWER RELAY TEST (TYPE B)

1. There should be continuity between the No.1 and No.2 terminals when power and ground are connected to the No.3 and No.4 terminals.
2. There should be no continuity between the No.1 and No.2 terminals when power is disconnected.


Head lamp relay
Power window relay
Rear window defogger relay
2
3
1
4
1
2
3
4

Terminal / Power (No.3-No.4)	1	2	3	4
Disconnected			○	○
Connected	○	○	⊖	⊕

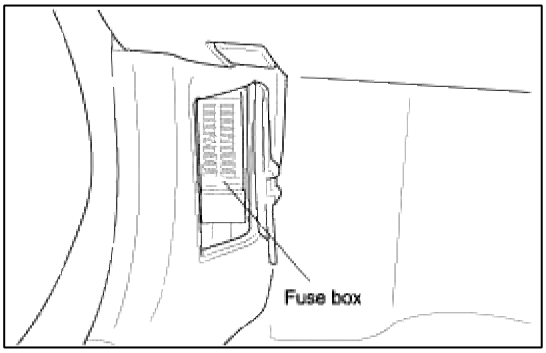
FUSE INSPECTION

1. Be sure there is no play in the fuse holders, and that the fuses are held securely.
2. Are the fuse capacities for each circuit correct?

3. Are there any blown fuses?
   If a fuse is to be replaced, be sure to use a new fuse of the same capacity. Always determine why the fuse blew and completely eliminate the problem before installing a new fuse.

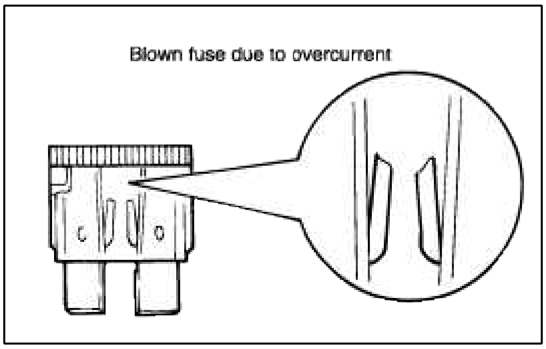
   CAUTION

   Never use a fuse of higher capacity than specified.

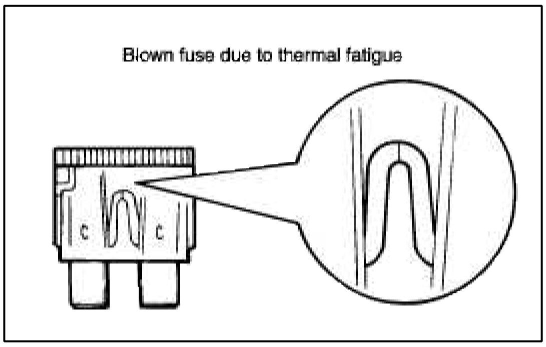
   

FUSES

1. **Fuse blown due to over-current.**
   Prior to replacing the fuse with a new one, check the circuit for a short and the related parts for abnormal conditions. Only after the correction of a short or replacement of abnormal parts, should a fuse with the same ampere rating be installed.

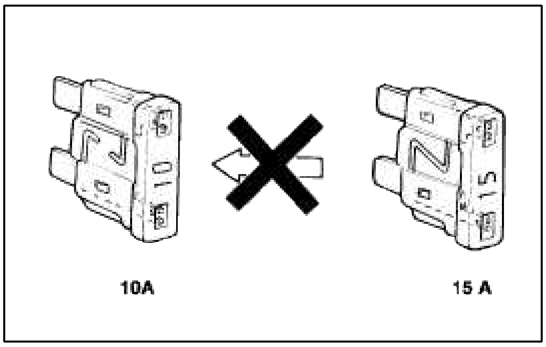
   

2. **Fuse blown due to repeated on-off current.**
   Normally, this type of problem occurs after a fairly long period of use, and is less frequent than #1 above. In this case, you may simply replace with a new fuse of the same capacity.

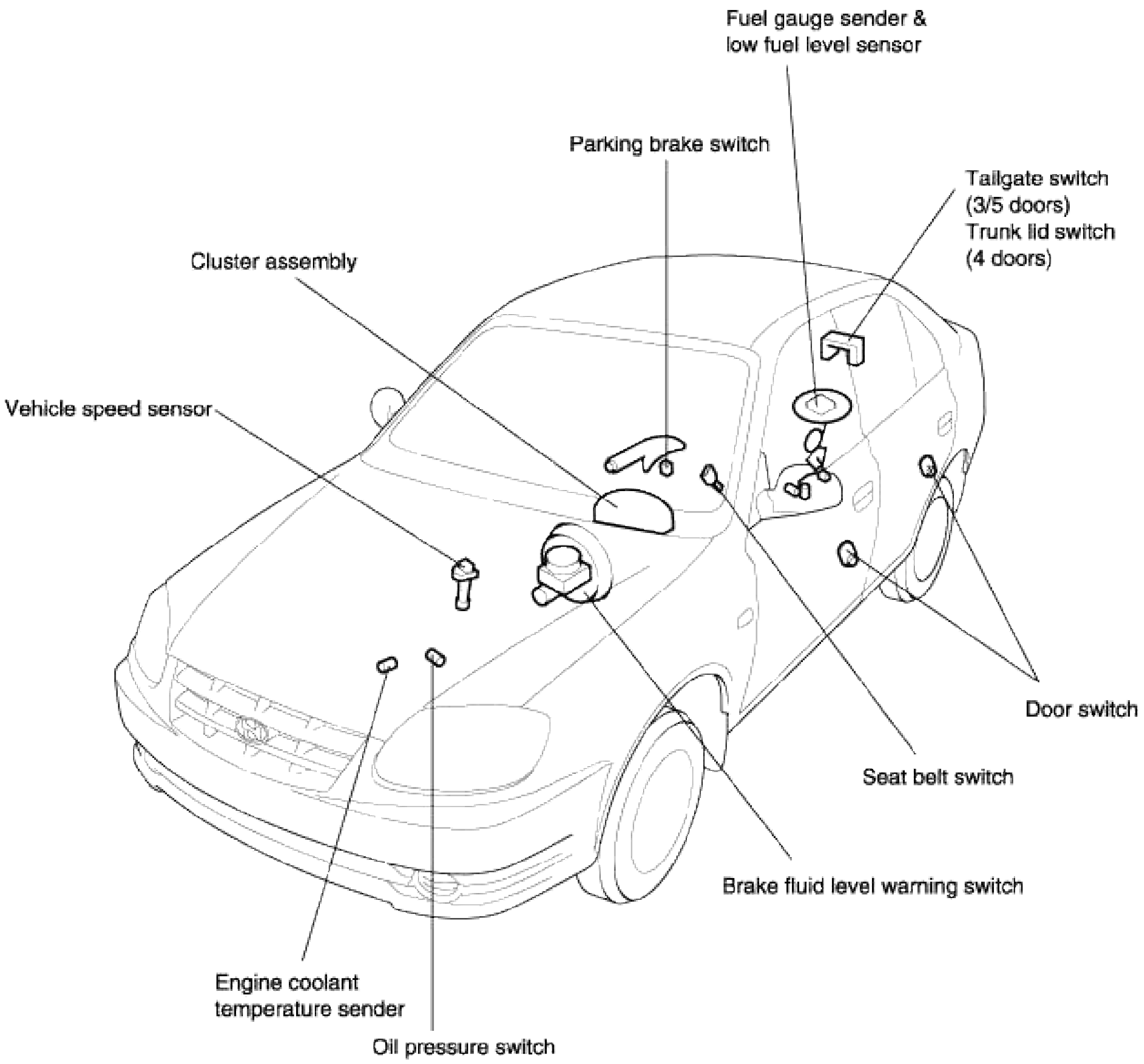
CAUTION

A blade type fuse is identified by the numbered value in amperes. If the fuse is blown, be sure to replace a fuse with the same ampere rating.If a fuse of higher capacity than specified is used, parts may be damaged and a danger of fire exists. To remove or insert a fuse, use the fuse puller in the fuse box.



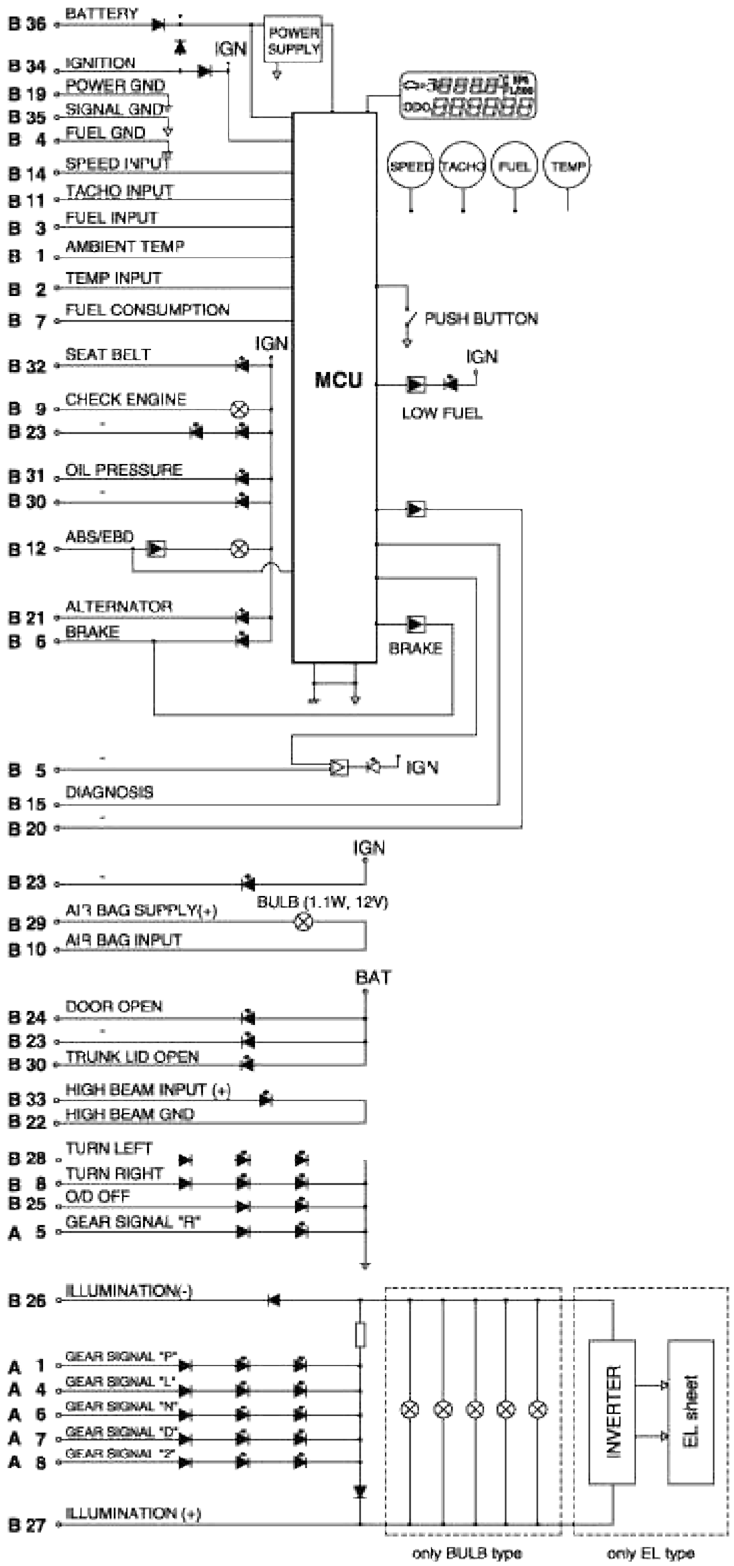
Body Electrical System > Indicators And Gauges > Components and Components Location

COMPONENTS


Fuel gauge sender &
low fuel level sensor
Parking brake switch
Tailgate switch
(3/5 doors)
Trunk lid switch
(4 doors)
Cluster assembly
Vehicle speed sensor
Door switch
Seat belt switch
Brake fluid level warning switch
Engine coolant
temperature sender
Oil pressure switch

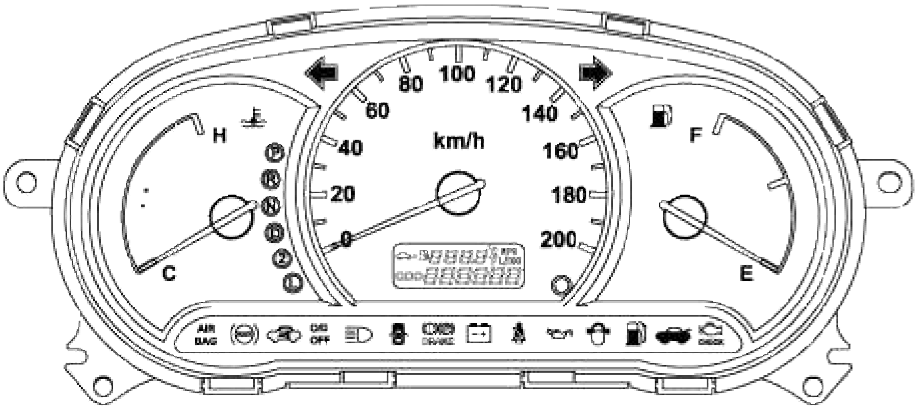
Body Electrical System > Indicators And Gauges > Instrument Cluster > Schematic Diagrams

CIRCUIT DIAGRAM

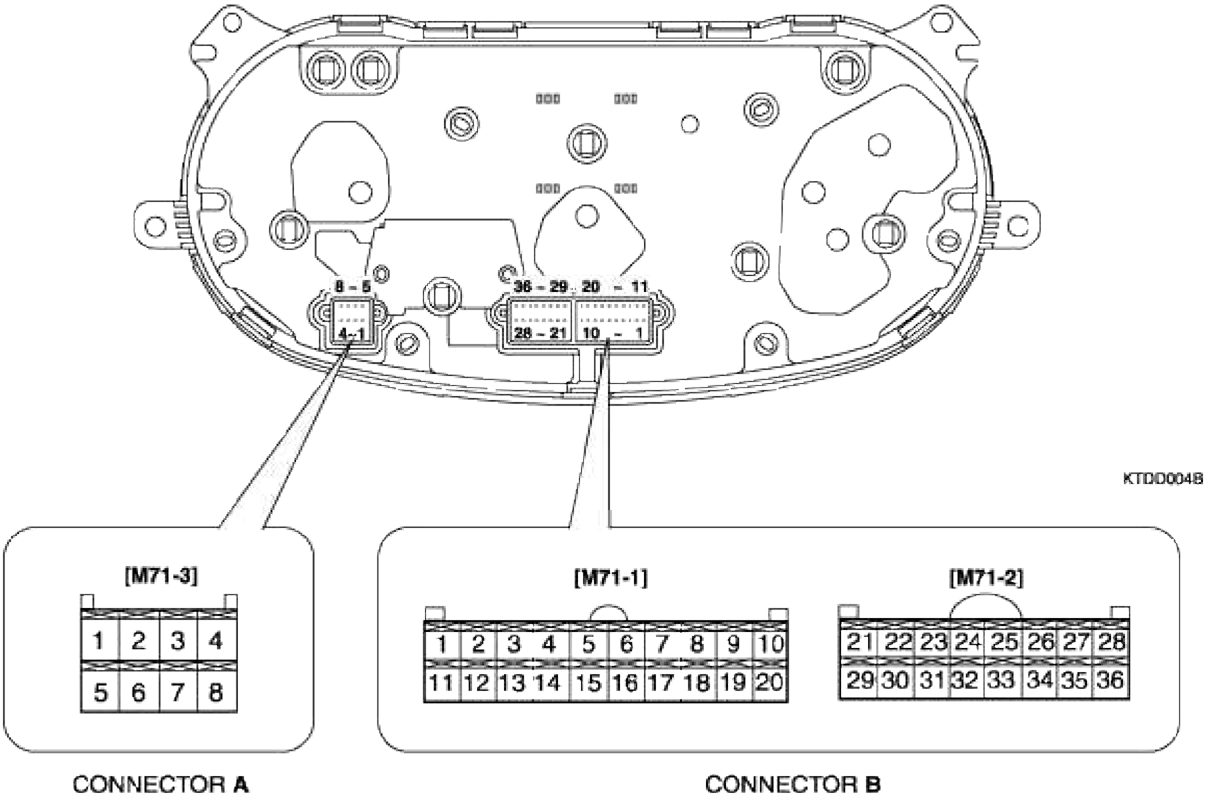

B 36 BATTERY
POWER SUPPLY
IGN
B 34 IGNITION
B 19 POWER GND
B 35 SIGNAL GND
B 4 FUEL GND
B 14 SPEED INPUT
B 11 TACHO INPUT
B 3 FUEL INPUT
B 1 AMBIENT TEMP
B 2 TEMP INPUT
B 7 FUEL CONSUMPTION
B 32 SEAT BELT
B 9 CHECK ENGINE
B 23
B 31 OIL PRESSURE
B 30
B 12 ABS/EBD
B 21 ALTERNATOR
B 6 BRAKE
MCU
ODO
SPEED
TACHO
FUEL
TEMP
PUSH BUTTON
LOW FUEL
BRAKE
B 5
B 15 DIAGNOSIS
B 20
B 23
BULB (1.1W, 12V)
B 29 AIR BAG SUPPLY(+)
B 10 AIR BAG INPUT
BAT
B 24 DOOR OPEN
B 23
B 30 TRUNK LID OPEN
B 33 HIGH BEAM INPUT (+)
B 22 HIGH BEAM GND
B 28 TURN LEFT
B 8 TURN RIGHT
B 25 O/D OFF
A 5 GEAR SIGNAL "R"
B 26 ILLUMINATION(-)
A 1 GEAR SIGNAL "P"
A 4 GEAR SIGNAL "L"
A 6 GEAR SIGNAL "N"
A 7 GEAR SIGNAL "D"
A 8 GEAR SIGNAL "2"
B 27 ILLUMINATION (+)
INVERTER
EL sheet
only BULB type
only EL type

Body Electrical System > Indicators And Gauges > Instrument Cluster > Components and Components Location

COMPONENTS


H
C
F
E
P
R
N
D
2
L
0
20
40
60
80
100
120
140
160
180
200
km/h
AIR BAG
O/D OFF
BRAKE
CHECK

KTDD004A

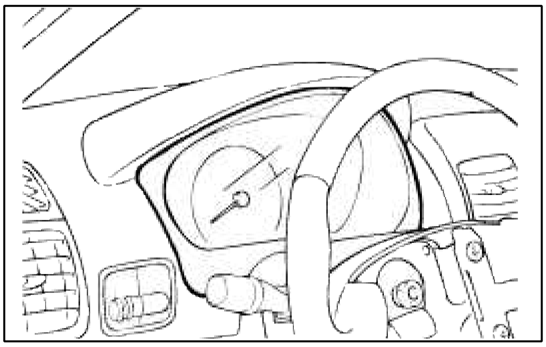

8 - 5
4 - 1
36 - 29
20 - 11
28 - 21
10 - 1
KTDD004B
[M71-3]
1 2 3 4
5 6 7 8
[M71-1]
1 2 3 4 5 6 7 8 9 10
11 12 13 14 15 16 17 18 19 20
[M71-2]
21 22 23 24 25 26 27 28
29 30 31 32 33 34 35 36
CONNECTOR A
CONNECTOR B

Body Electrical System > Indicators And Gauges > Instrument Cluster > Repair procedures

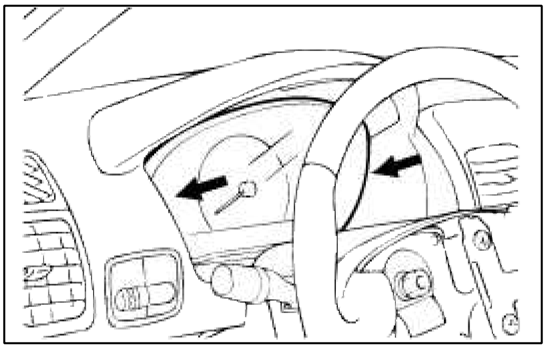
REMOVAL AND INSTALLATION

1. Disconnect the negative(-) battery terminal.

2. Remove the cluster facia panel.



3. Remove the cluster from the housing after removing screws.



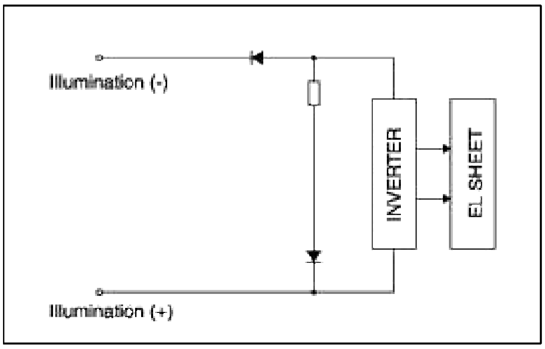
4. Disconnect the wire connectors from the cluster.
5. Installation is the reverse of removal.

INSPECTION

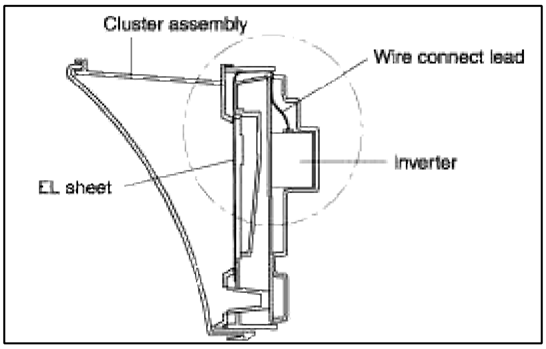
INVERTER (WITH EL TYPE CLUSTER)

The inverter is located in the instrument cluster and it converts the direct current (DC) into the alternating current (AC).

Illumination power applied to inverter in the cluster is converted into the alternating current (AC), which is supplied EL (Electroluminescent Lamp) sheets to be illuminated.

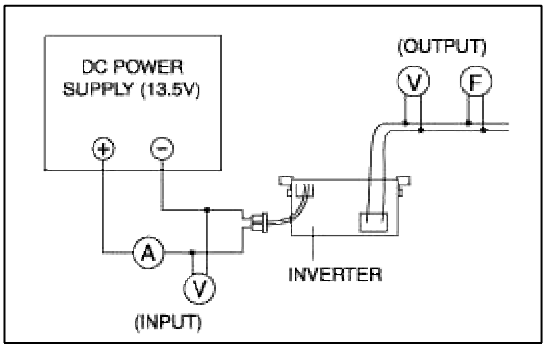

Illumination (-)
INVERTER
EL SHEET
Illumination (+)

1. Remove the front cover from the cluster and disconnect wire lead connector from EL sheet.


Cluster assembly
Wire connect lead
Inverter
EL sheet

2. Apply battery voltage (DC 13.5V) to the inverter in the cluster and measure the output voltage between terminal 1 and 2.

3. Also measure the output frequency between the terminals.



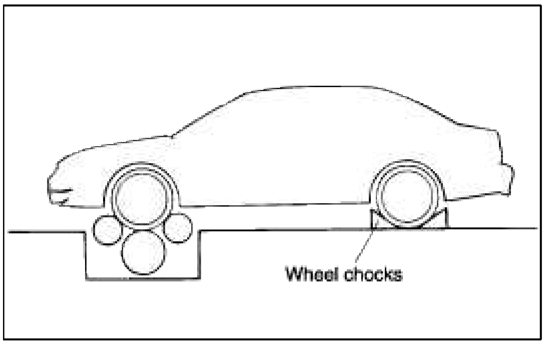
4. If the value is not as shown in the table, replace the inverter.

Input voltage	Input current	Output voltage	Output frequency	EL sheet luminosity
DC 13.5V ±1%	DC 30mA ±10%	40 Vrms ±20%	520Hz ±15%	11cd/m² ±8%

NOTE

If the inverter is normal, connect the EL and inverter, supply power to the cluster, and check the EL illuminates at the dark.
If EL illumination is too dark, should be replaced.

SPEEDOMETER



1. Adjust the pressure of the tires to the specified level.
2. Drive the vehicle onto a speedometer tester. Use wheel chocks as appropriate.
3. Check if the speedometer indicator range is within the standard values.

CAUTION

Do not operate the clutch suddenly or increase/ decrease speed rapidly while testing.

NOTE

Tire wear and tire over or under inflation will increase the indication error.

Velocity (km/h)	20	40	60	80	100
Tolerance (km/h)	20-24.4	40-44.4	61-65.4	81-86.5	102-107.5
Velocity (km/h)	120	140	160	180	200
Tolerance (km/h)	123-128.5	144-149.5	165-170.5	185-191.5	207-212.5

Velocity (MPH)	10	20	40	60	80	100	120	Remark
Tolerance (MPH)	10-13	20-22	40-43	60-63.8	80.3-84.1	100.3-104.1	120.3-124.1	Except U.S.A
Tolerance (MPH)	10±1.5	20±1.5	40±1.5	60±1.7	80±1.7	100±1.7	120±1.7	U.S.A

TACHOMETER

1. Connect the scan tool to the diagnostic link connector or install a tachometer.
2. With the engine started, compare the readings of the tester with that of the tachometer. Replace the tachometer if the tolerance is exceeded.

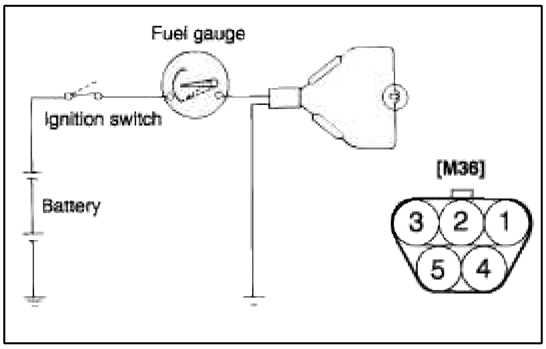
> CAUTION
>
> 1. Reversing the connections of the tachometer will damage the transistor and diodes inside.
> 2. When removing or installing the tachometer, be careful not to drop it or subject it to severe shock.

Revolution (RPM)	1,000	2,000	3,000	4,000	5,000	6,000	7,000	Remark
Tolerance (RPM)	±100	±125	±150	±170	±200	±240	±280	Gasoline
Tolerance (RPM)	±100	±125	±150	±170	±200	-	-	Diesel

FUEL GAUGE

OPERATION CHECK

1. Disconnect the fuel sender connector from the fuel sender.
2. Connect a 3.4 watt, 12V test bulb to terminals 2 and 3 on the wire harness side connector.
3. Turn the ignition switch to the ON, and then check that the bulb lights up and the fuel gauge needle moves to full.



FUEL SENDER

1. Using an ohmmeter, measure the resistance between terminals 2 and 3 at each float level.

Float position	F	1/2	E
Resistance (Ω)	8	66	200

2. Also check that the resistance changes smoothly when the float is moved from "E" to "F".

LOW FUEL LEVEL SENSOR

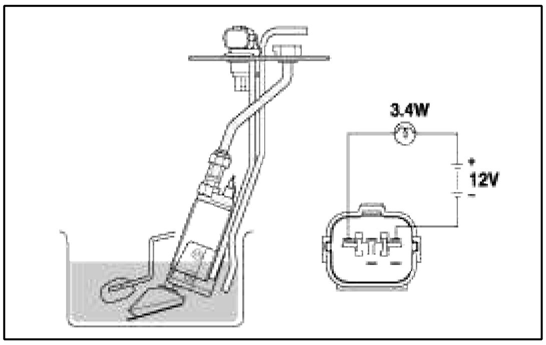
1. Connect a test lamp (12V, 3.4W) and the battery to the sender terminals 1 and 3. Immerse the sender in water.
2. The lamp should be off while the thermister is submerged in the water, and should illuminate when the sender is taken out of the water.

NOTE

If there is a malfunction, replace the fuel sender as an assembly.

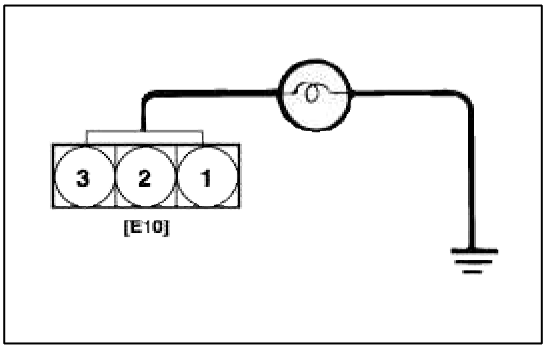
CAUTION

After completing this test, wipe the sender dry and reinstall it in the fuel tank.



ENGINE COOLANT TEMPERATURE GAUGE

1. Disconnect the wiring connector from the engine coolant temperature sender in the engine compartment.
2. Turn the ignition switch ON. Check that the gauge needle indicates cool. Turn the ignition switch OFF.
3. Connect a 12V, 3.4 watt test bulb between the harness side connector and ground.

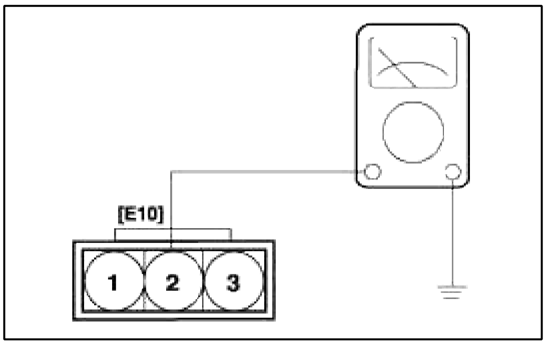


4. Turn the ignition switch ON.
5. Verify that the test bulb flashes and that the indicator moves to HOT.

If operation is not as specified, replace the engine coolant temperature gauge. Then recheck the system.

ENGINE COOLANT TEMPERATURE SENDER

1. Using an ohmmeter, measure the resistance between the terminal 2 and ground.

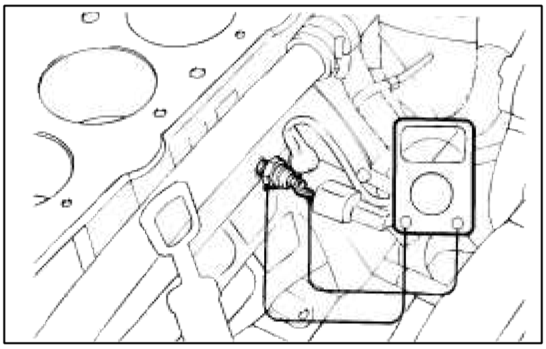


2. If the resistance value is not as shown in the table, replace the temperature sender.

Temperature (°C)	55	85	110	125
Resistance (Ω)	160.3	70.3	27.9	18.6

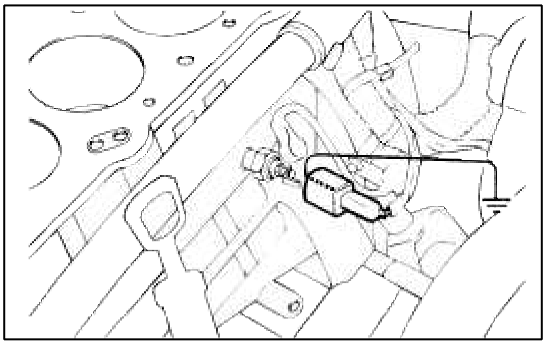
OIL PRESSURE SWITCH

1. Check that there is continuity between the terminal and ground with the engine off.
2. Check that there is no continuity between the terminal and ground with the engine running.
3. If operation is not as specified, replace the switch.



OIL PRESSURE WARNING LAMP

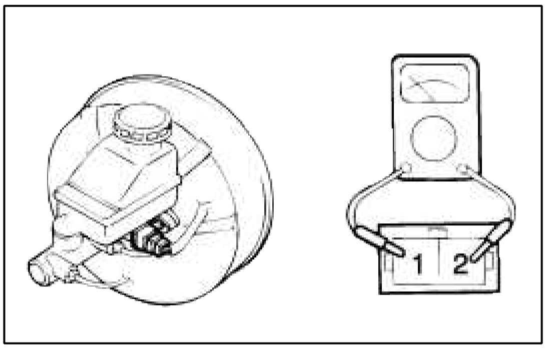
1. Disconnect the connector from the warning switch and ground the terminal on the wire harness side connector.
2. Turn the ignition switch ON. Check that the warning lamp lights up.If the warning lamp doesn't light, test the bulb or inspect the wire harness.



BRAKE FLUID LEVEL WARNING SWITCH

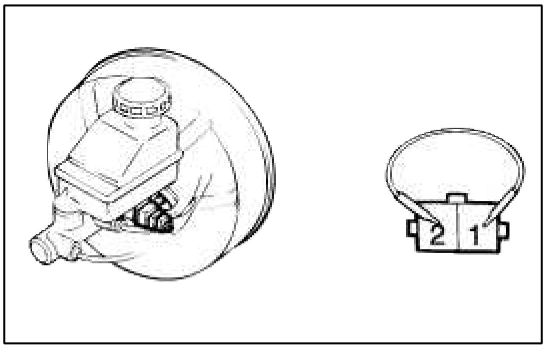
1. Remove the connector from the switch located at the brake fluid reservoir.

2. Verify that continuity exists between switch terminals 1 and 2 while pressing the switch (float) down with a rod.



BRAKE FLUID LEVEL WARNING LAMP

1. Start the engine.
2. Release the parking brake.
3. Remove the connector from the brake fluid level warning switch.
4. Ground the connector at the harness side.
5. Verify that the warning lamp lights.

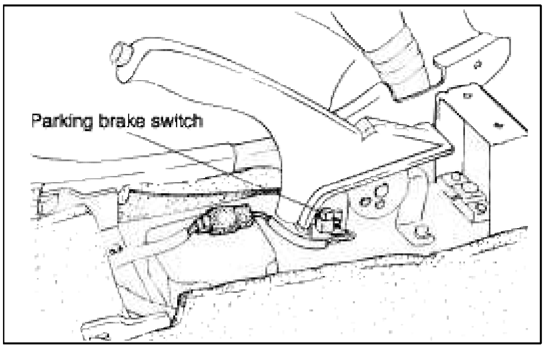


PARKING BRAKE SWITCH

The parking brake switch is a push type located under the parking brake lever. To adjust, move the switch mount up and down with the parking brake lever released all the way.

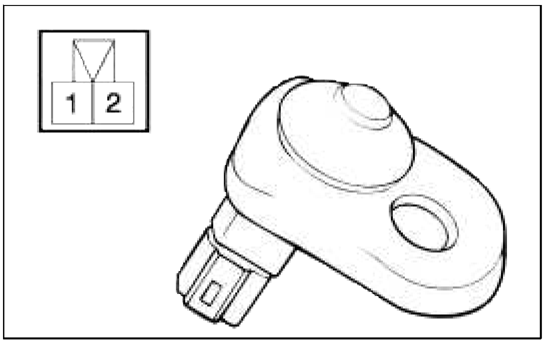
1. Check that there is continuity between the terminal and switch body with the switch ON (Lever is pulled).
2. Check that there is no continuity between the terminal and switch bodywith the switch OFF (Lever is released).

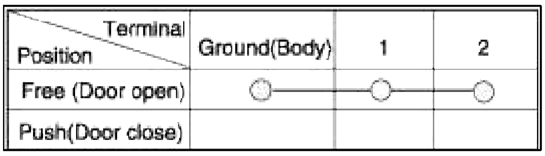
If continuity is not as specified, replace the switch or inspect its ground connection.



DOOR SWITCH

Remove the door switch and check for continuity between the terminals.



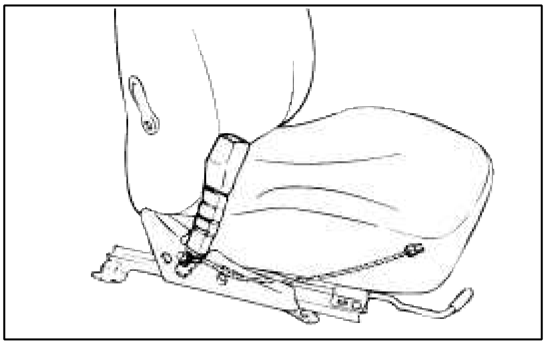


Terminal / Position	Ground(Body)	1	2
Free (Door open)	○	○	○
Push(Door close)			

SEAT BELT SWITCH

1. Remove the connector from the switch.
2. Check for continuity between terminals.

Seat belt condition	Continuity
Fastened	Non-conductive (∞Ω)
Not fastened	Conductive (Ω)



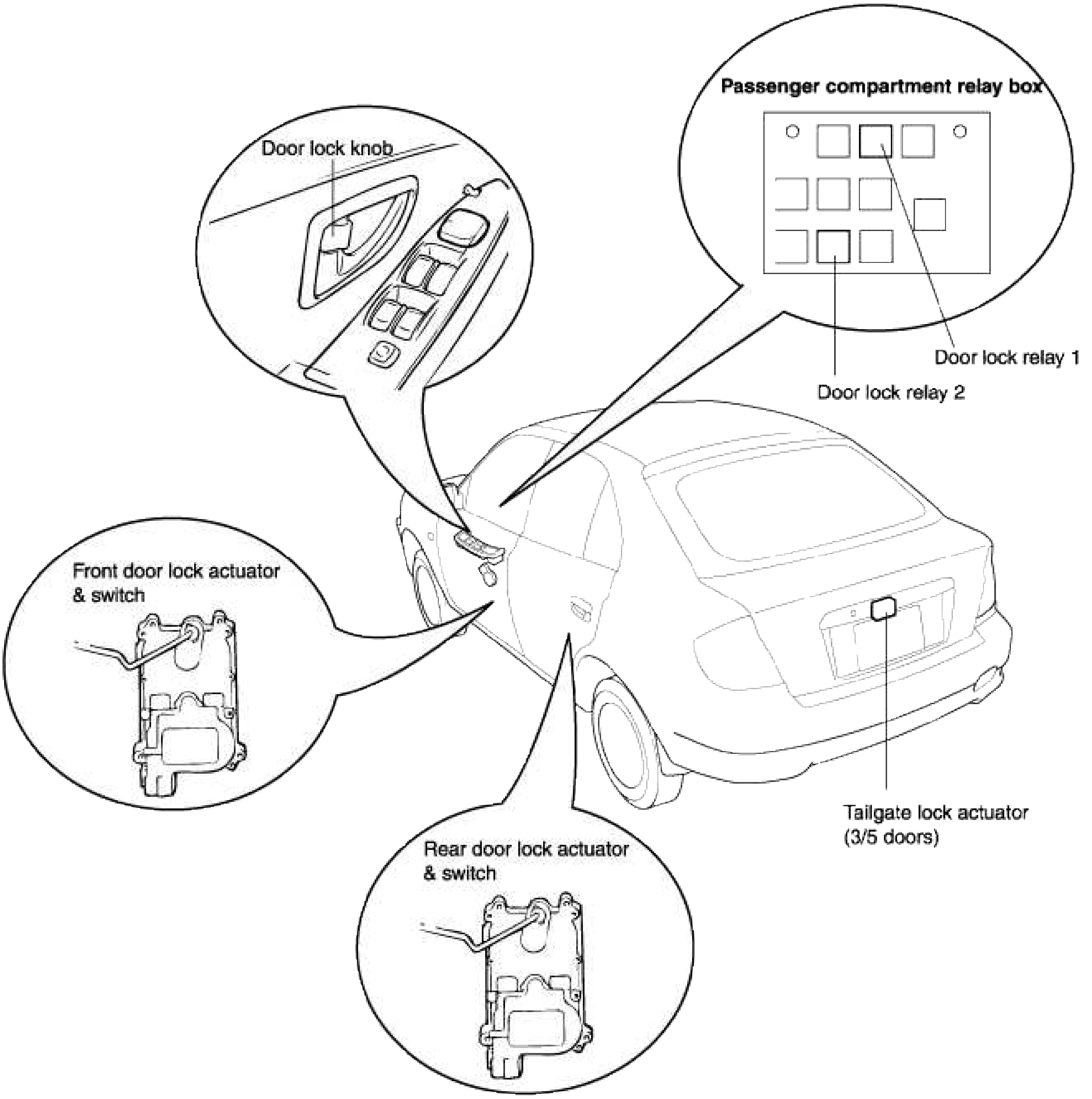
SEAT BELT WARNING LAMP

With the ignition switch turned ON, verify that the lamp glows.

Seat belt condition	Warning lamp
Fastened	OFF
Not fastened	ON

Body Electrical System > Power Door Locks > Components and Components Location

COMPONENTS


Passenger compartment relay box
Door lock knob
Door lock relay 1
Door lock relay 2
Front door lock actuator & switch
Tailgate lock actuator (3/5 doors)
Rear door lock actuator & switch

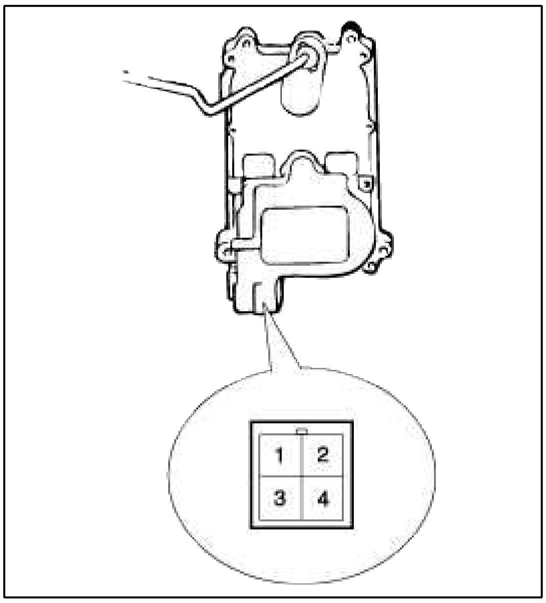
Body Electrical System > Power Door Locks > Power Door Lock Actuators > Repair procedures

INSPECTION

FRONT DOOR LOCK ACTUATOR INSPECTION

1. Remove the front door trim panel. (Refer to BD group-Front door)

2. Disconnect the 4P connector from the actuator.

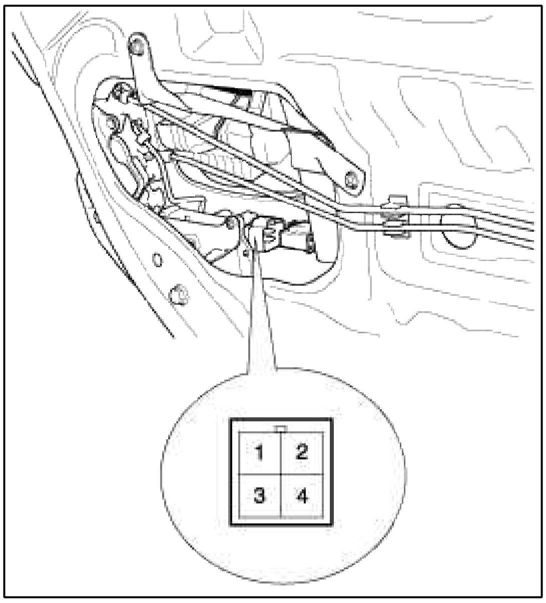


3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal		2	4
Front left	Unlock	⊖	⊕
	Lock	⊕	⊖
Front right	Unlock	⊕	⊖
	Lock	⊖	⊕

REAR DOOR LOCK ACTUATOR INSPECTION

1. Remove the rear door trim panel. (Refer to BD group-Rear door)
2. Disconnect the 4P connector from the actuator.

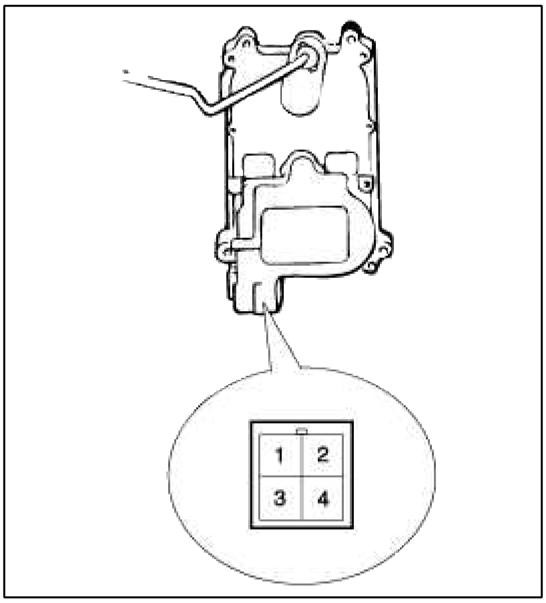


3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal		2	4
Rear left	Lock	⊖	⊕
	Unlock	⊕	⊖
Rear right	Lock	⊕	⊖
	Unlock	⊖	⊕

FRONT DOOR LOCK SWITCH INSPECTION

1. Remove the front door trim panel. (Refer to BD group-Front door)
2. Disconnect the 4P connector from the actuator.

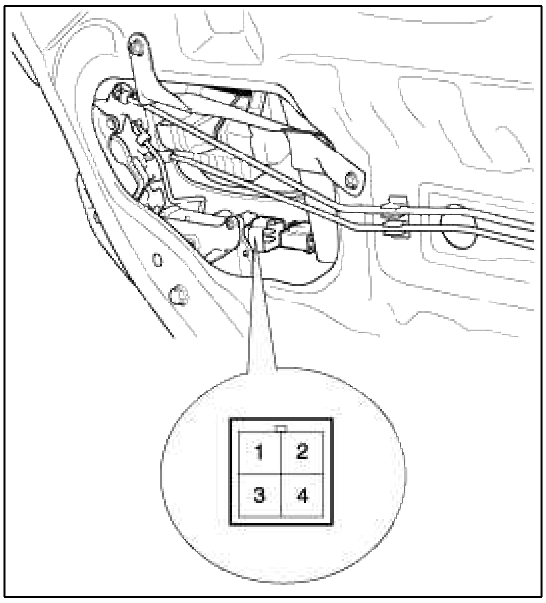


3. Check for continuity between the terminals in each switch position according to the table.

Position		Terminal 1	Terminal 3
Front left	Lock		
	Unlock	○	○
Front right	Lock		
	Unlock	○	○

REAR DOOR LOCK SWITCH INSPECTION

1. Remove the rear door trim panel. (Refer to BD group-Rear door)
2. Disconnect the 4P connector from the actuator.



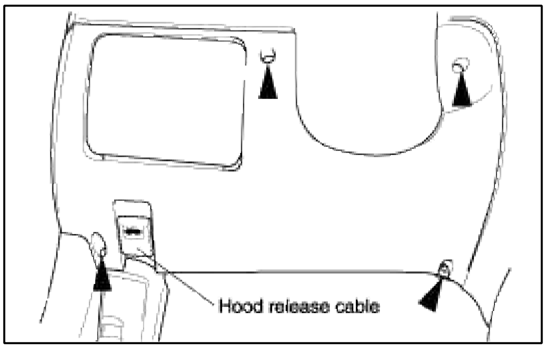
3. Check for continuity between the terminals in each switch position according to the table.

Position		Terminal 1	Terminal 3
Rear left	Lock		
	Unlock	○	○
Rear right	Lock		
	Unlock	○	○

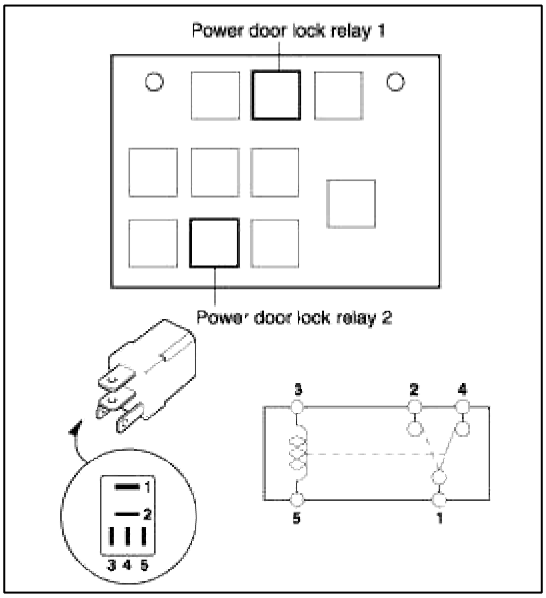
Body Electrical System > Power Door Locks > Power Door Lock Relay > Repair procedures

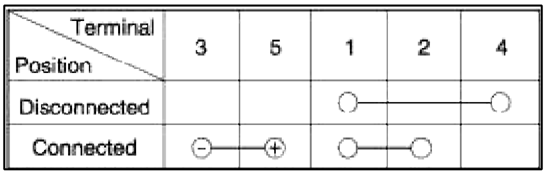
INSPECTION

1. Remove the negative(-) battery terminal.
2. Remove the driver's side crash pad lower panel. (Refer to BD group)


Hood release cable

3. Remove the door lock relay in the passenger compartment relay box, then check for continuity between the terminals.

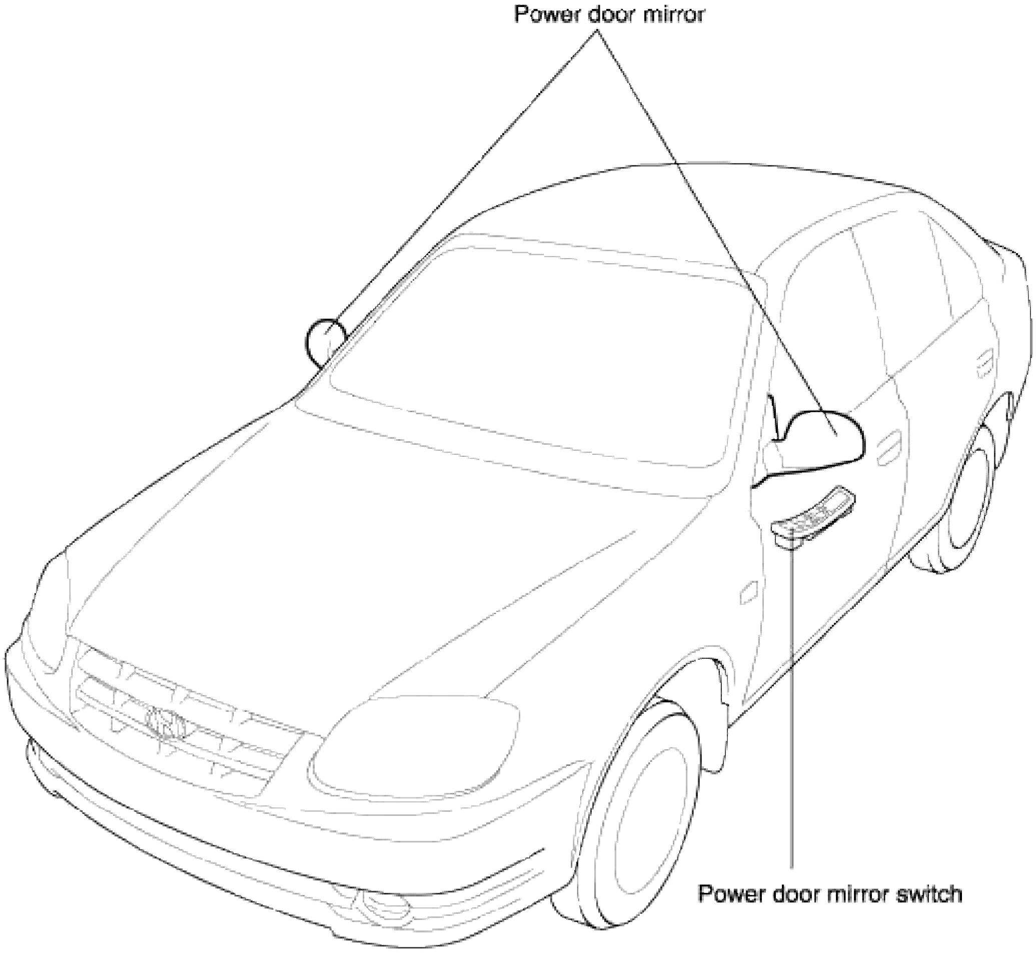

Power door lock relay 1
Power door lock relay 2
3
2
4
5
1
1
2
3 4 5



Terminal / Position	3	5	1	2	4
Disconnected			○	—	○
Connected	⊖	⊕	○	○	

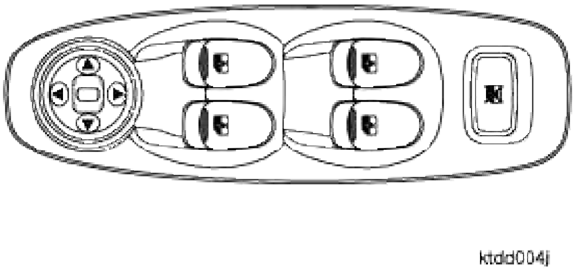
Body Electrical System > Power Door Mirrors > Components and Components Location

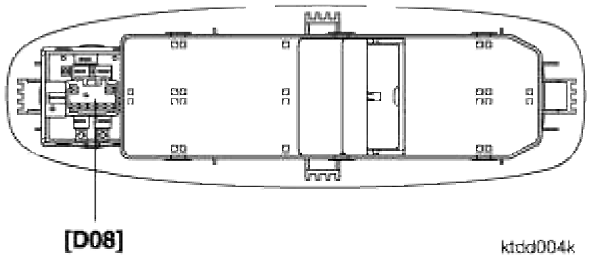
COMPONENTS

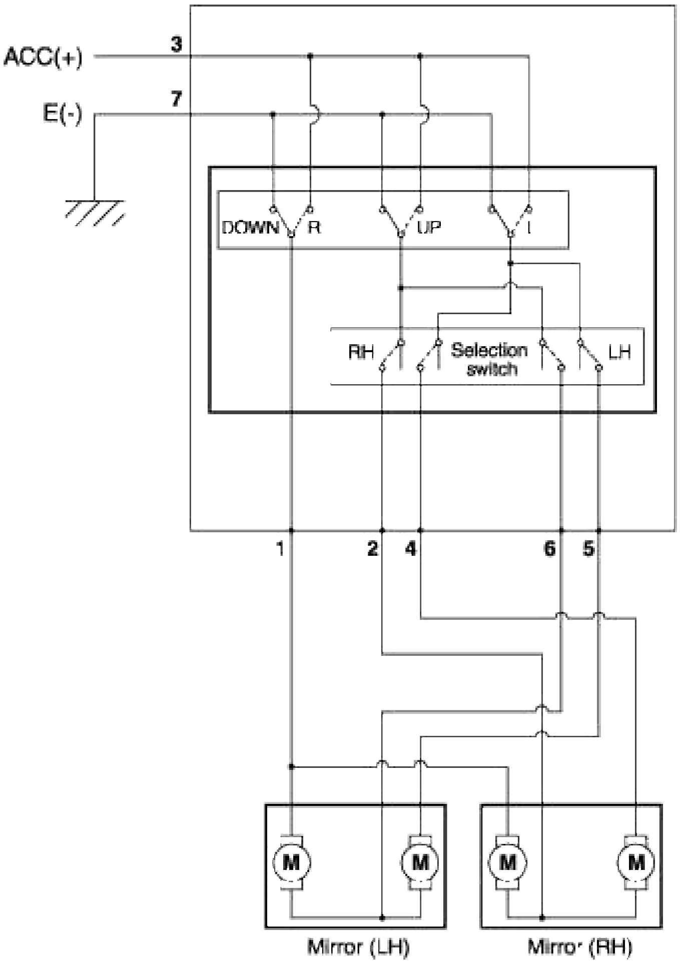

Power door mirror
Power door mirror switch

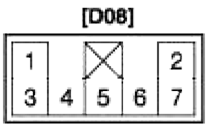
Body Electrical System > Power Door Mirrors > Power out side mirror switch > Schematic Diagrams

CIRCUIT DIAGRAM




[D08]
ktdd004k


ACC(+)
E(-)
3
7
DOWN
R
UP
L
RH
Selection switch
LH
1
2
4
6
5
M
M
M
M
Mirror (LH)
Mirror (RH)

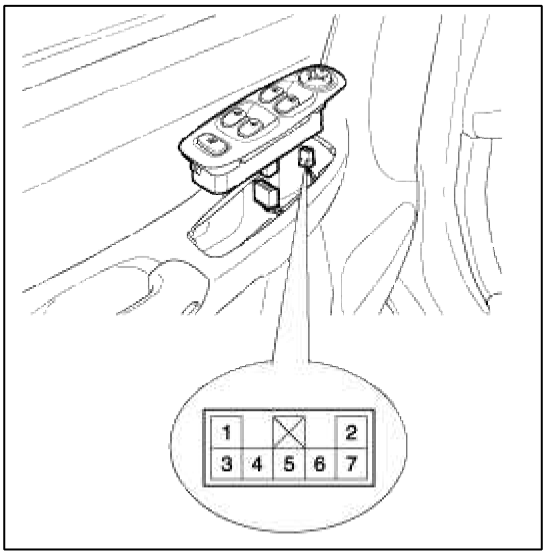

[D08]
1
2
3
4
5
6
7

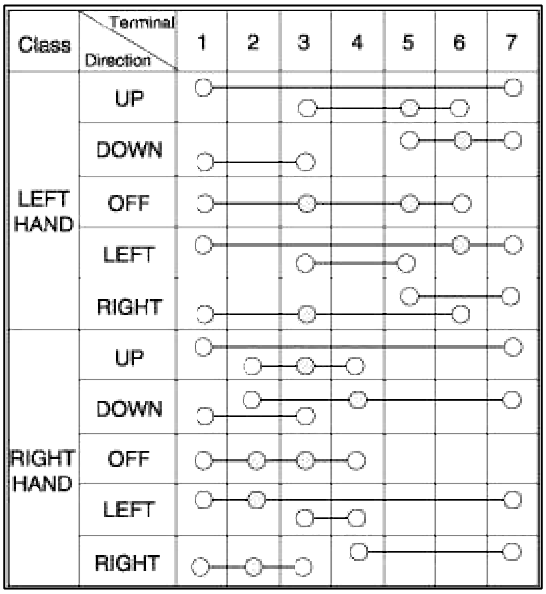
Body Electrical System > Power Door Mirrors > Power out side mirror switch > Repair procedures

INSPECTION

1. Remove the power door mirror switch from the door trim panel.

2. Check for continuity between the terminals in each switch position according to the table.





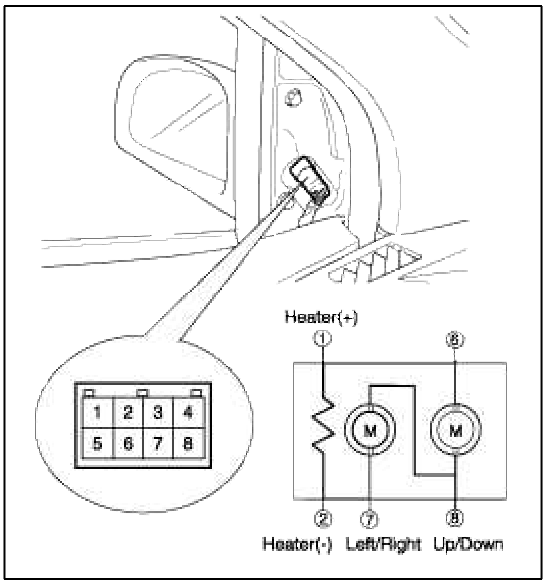
Class	Terminal / Direction	1	2	3	4	5	6	7
LEFT HAND	UP	○						○
				○		○	○	
	DOWN					○	○	○
		○		○				
	OFF	○		○		○	○	
	LEFT	○					○	○
				○		○		
	RIGHT					○		○
		○		○			○	
RIGHT HAND	UP	○						○
			○	○	○			
	DOWN		○		○			○
		○		○				
	OFF	○	○	○	○			
	LEFT	○	○					○
				○	○			
	RIGHT				○			○
		○	○	○				

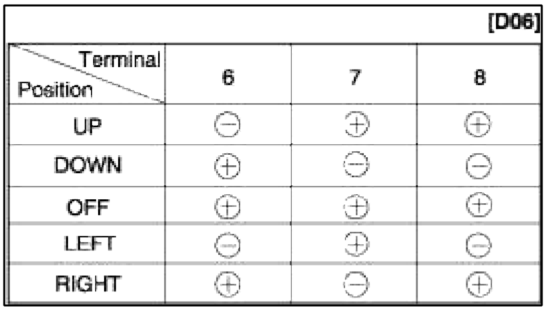
Body Electrical System > Power Door Mirrors > Power Door Mirror Actuator > Repair procedures

INSPECTION

1. Disconnect the power door mirror connector from the harness.

2. Apply battery voltage to each terminal as shown in the table and verify that the mirror operates properly.

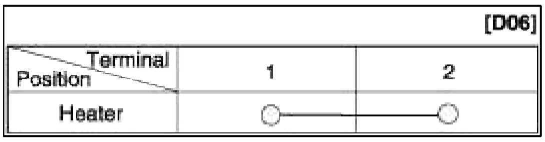

Heater(+)
①
⑥
1 2 3 4
5 6 7 8
M
M
②
⑦
⑧
Heater(-)
Left/Right
Up/Down



[D06]

Terminal / Position	6	7	8
UP	⊖	⊕	⊕
DOWN	⊕	⊖	⊖
OFF	⊕	⊕	⊕
LEFT	⊖	⊕	⊖
RIGHT	⊕	⊖	⊕

MIRROR HEATER INSPECTION

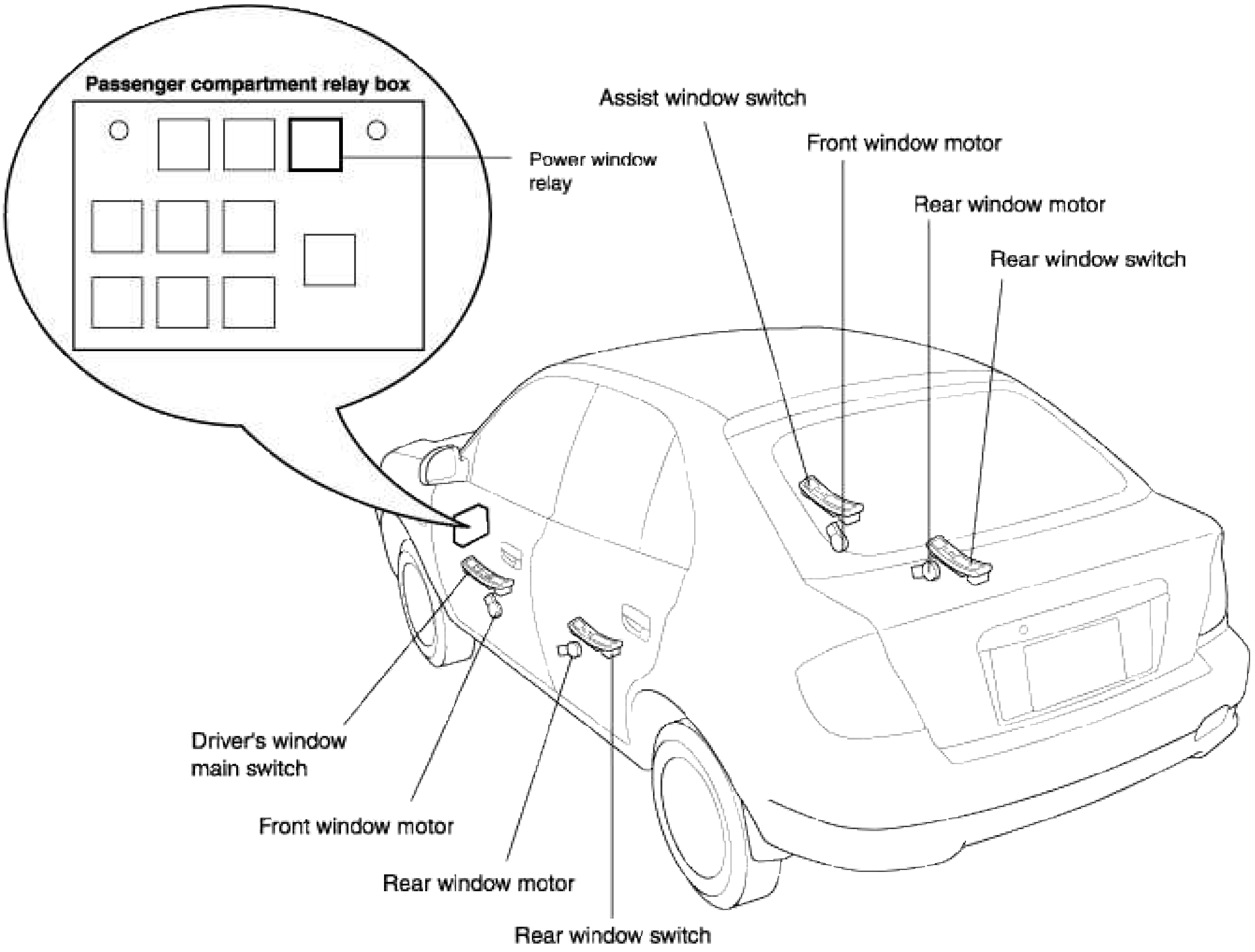


[D06]

Terminal / Position	1	2
Heater	○—	—○

Body Electrical System > Power Windows > Components and Components Location

COMPONENTS


Passenger compartment relay box
Power window relay
Assist window switch
Front window motor
Rear window motor
Rear window switch
Driver's window main switch
Front window motor
Rear window motor
Rear window switch

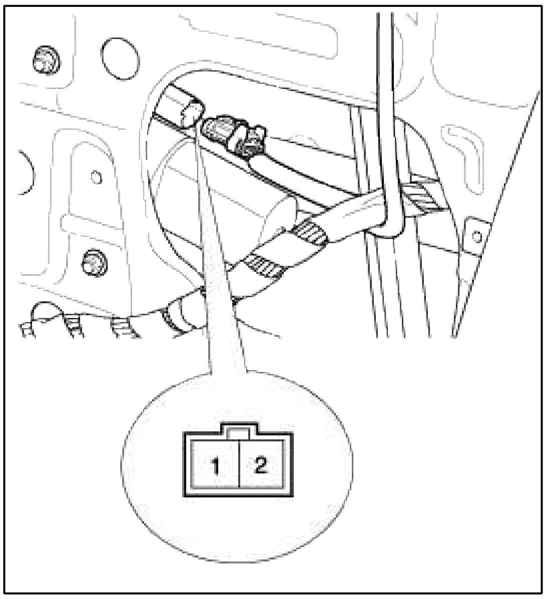
Body Electrical System > Power Windows > Power Window Motor > Repair procedures

INSPECTION

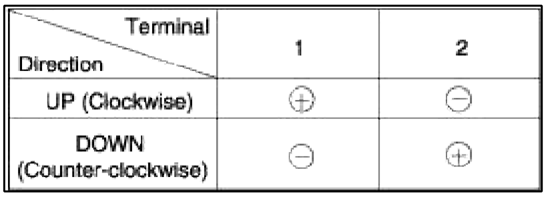
FRONT POWER WINDOW MOTOR INSPECTION

1. Remove the front door trim panel. (Refer to BD group-Front door)

2. Disconnect the 2P connector from the motor.



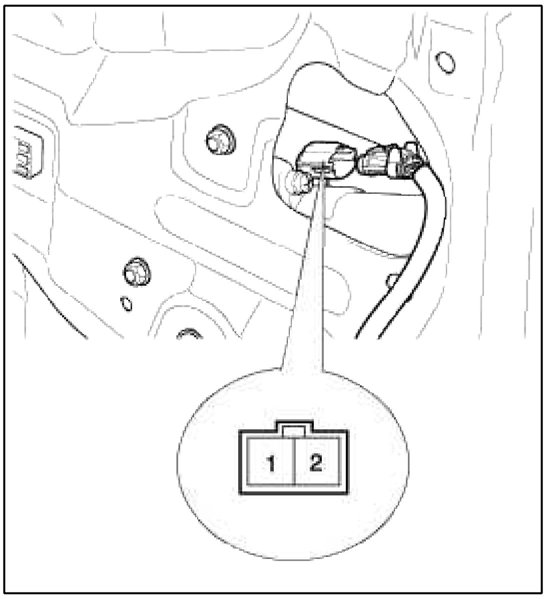
3. Connect the motor terminals directly to battery voltage (12V) and check that the motor operates smoothly. Next, reverse the polarity and check that the motor operates smoothly in the reverse direction. If the operation is abnormal, replace the motor.



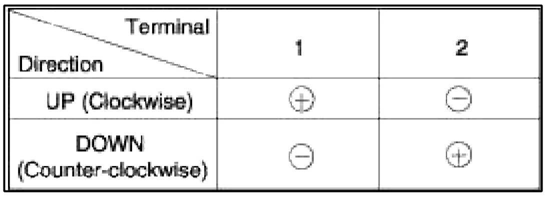
Terminal / Direction	1	2
UP (Clockwise)	⊕	⊖
DOWN (Counter-clockwise)	⊖	⊕

REAR POWER WINDOW MOTOR INSPECTION

1. Remove the rear door trim panel. (Refer to BD group-Rear door)
2. Disconnect the 2P connector from the motor.



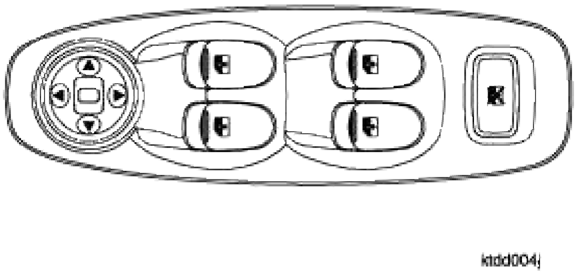
3. Connect the motor terminals directly to battery voltage (12V) and check that the motor operates smoothly. Next, reverse the polarity and check that the motor operates smoothly in the reverse direction. If the operation is abnormal, replace the motor.

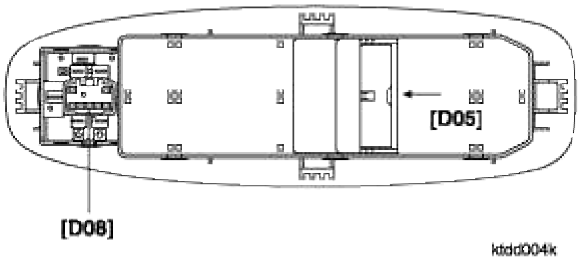


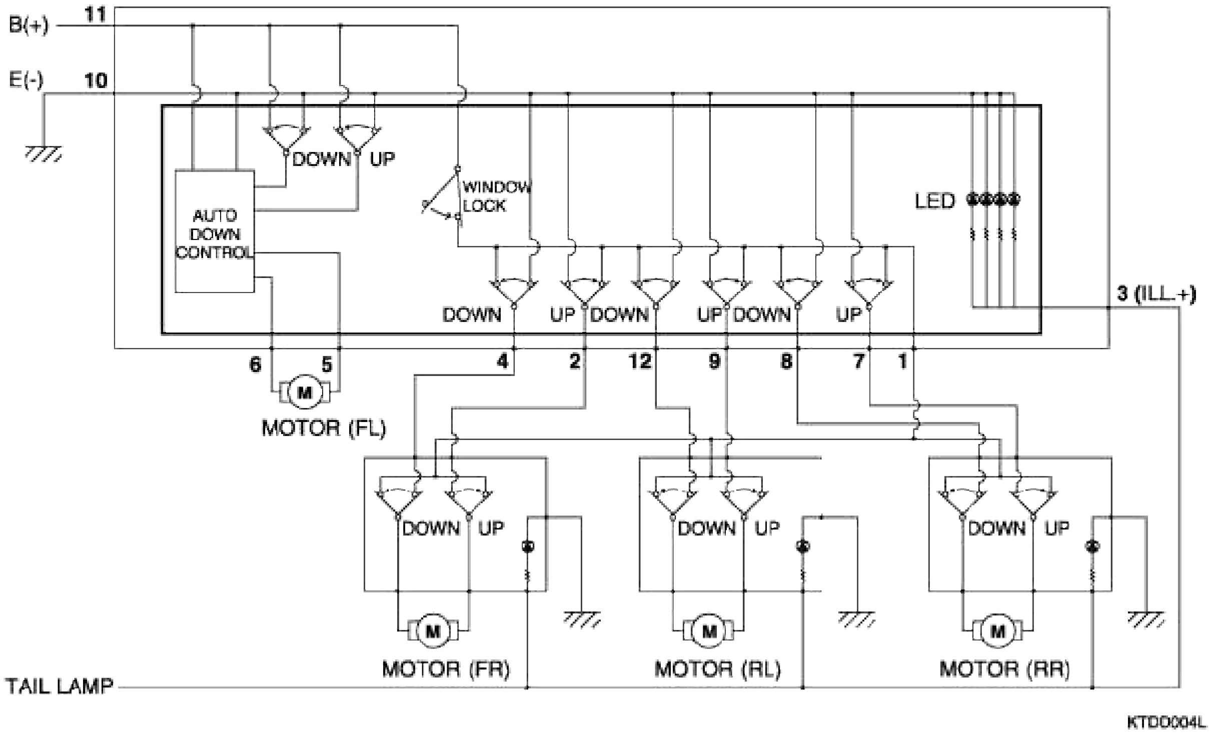
Terminal / Direction	1	2
UP (Clockwise)	⊕	⊖
DOWN (Counter-clockwise)	⊖	⊕

CIRCUIT DIAGRAM

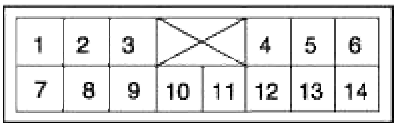
[POWER WINDOW MAIN SWITCH]



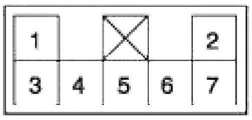

[D05]
[D08]
ktdd004k


B(+)
11
E(-)
10
DOWN
UP
WINDOW LOCK
AUTO DOWN CONTROL
LED
DOWN
UP
DOWN
UP
DOWN
UP
3 (ILL.+)
6
5
4
2
12
9
8
7
1
MOTOR (FL)
DOWN
UP
DOWN
UP
DOWN
UP
M
MOTOR (FR)
MOTOR (RL)
MOTOR (RR)
TAIL LAMP
KTDD004L

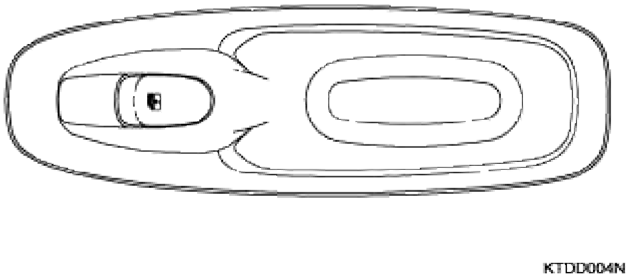
[D05]

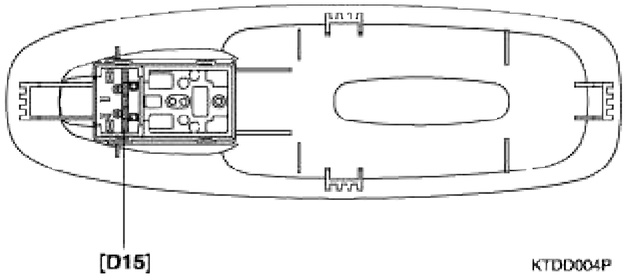

1
2
3
4
5
6
7
8
9
10
11
12
13
14

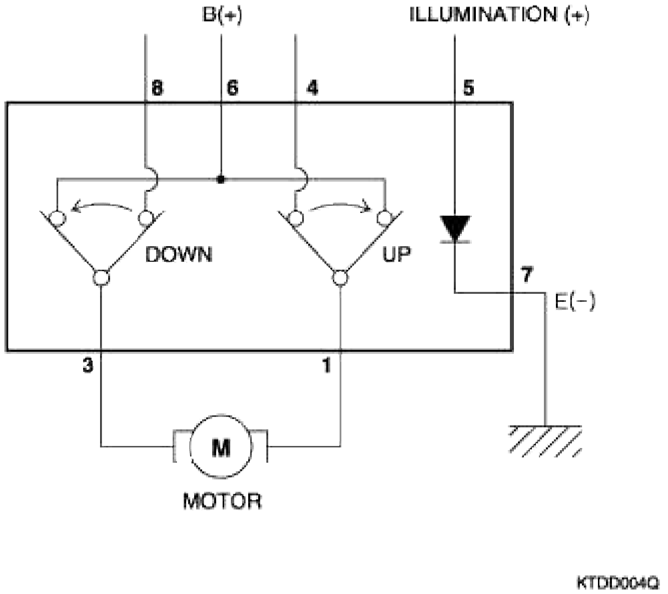
[D08]

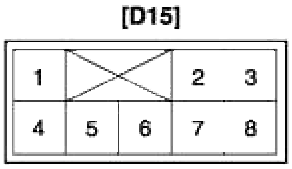


[POWER WINDOW SUB SWITCH]




[D15]
KTDD004P


B(+)
ILLUMINATION (+)
8
6
4
5
DOWN
UP
7
E(-)
3
1
M
MOTOR
KTDD004Q

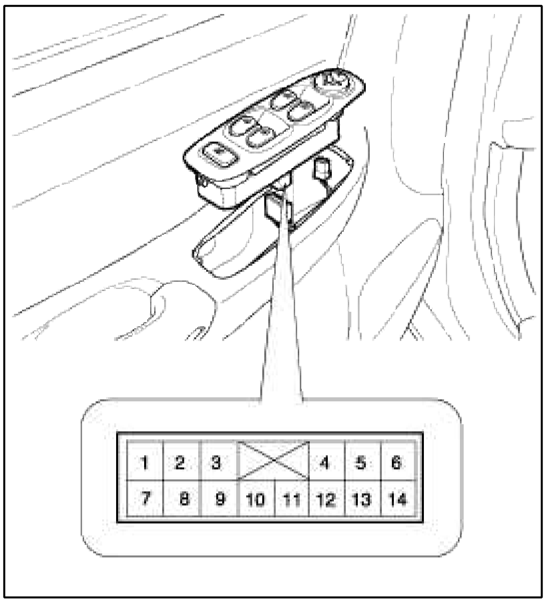

[D15]
1
2
3
4
5
6
7
8

Body Electrical System > Power Windows > Power Window Switch > Repair procedures

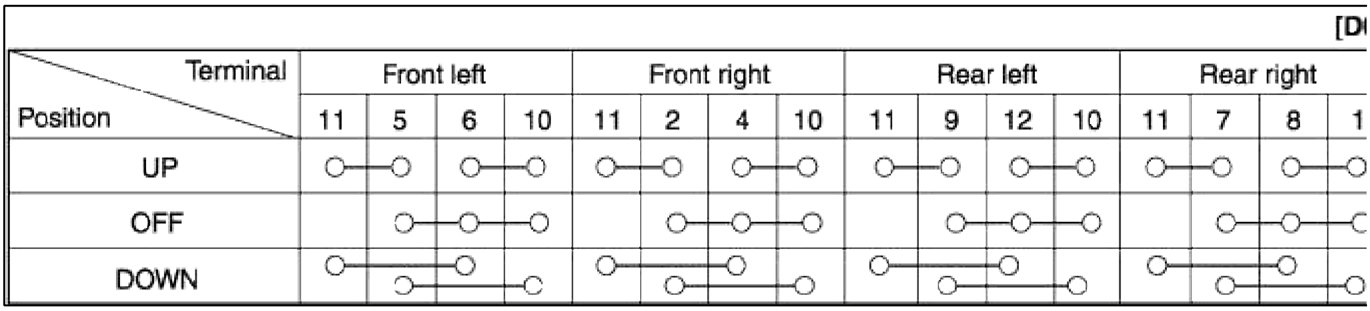
INSPECTION

POWER WINDOW MAIN SWITCH

1. Remove the power window main switch from the driver's door trim panel.



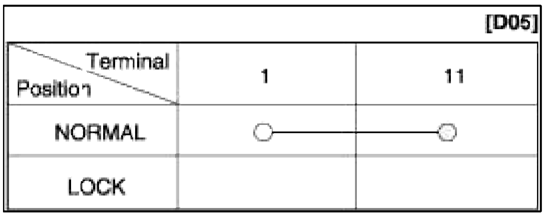
2. Check for continuity between the terminals.



[D

Terminal / Position	Front left 11	Front left 5	Front left 6	Front left 10	Front right 11	Front right 2	Front right 4	Front right 10	Rear left 11	Rear left 9	Rear left 12	Rear left 10	Rear right 11	Rear right 7	Rear right 8	Rear right 1
UP	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
OFF		○	○	○		○	○	○		○	○	○		○	○	○
DOWN	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

POWER WINDOW LOCK SWITCH

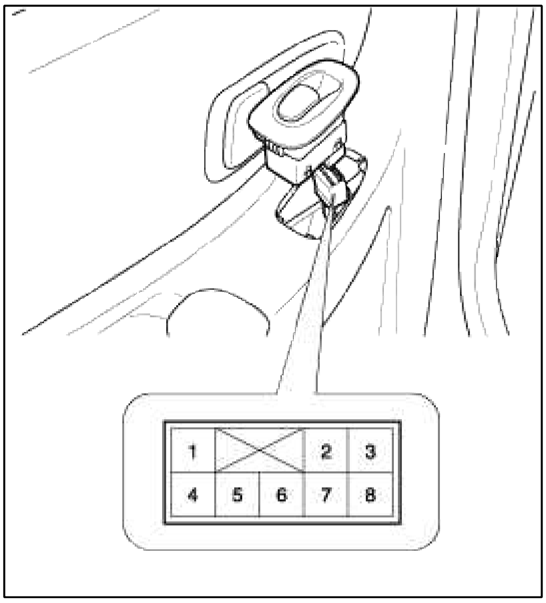


[D05]

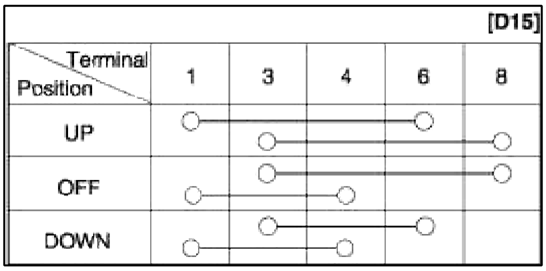
Terminal / Position	1	11
NORMAL	○	○
LOCK		

POWER WINDOW SUB SWITCH

1. Remove the power window sub switch from the rear door trim panel.



2. Check for continuity between the terminals.
   If continuity is not as specified in the table, replace the power window switch.

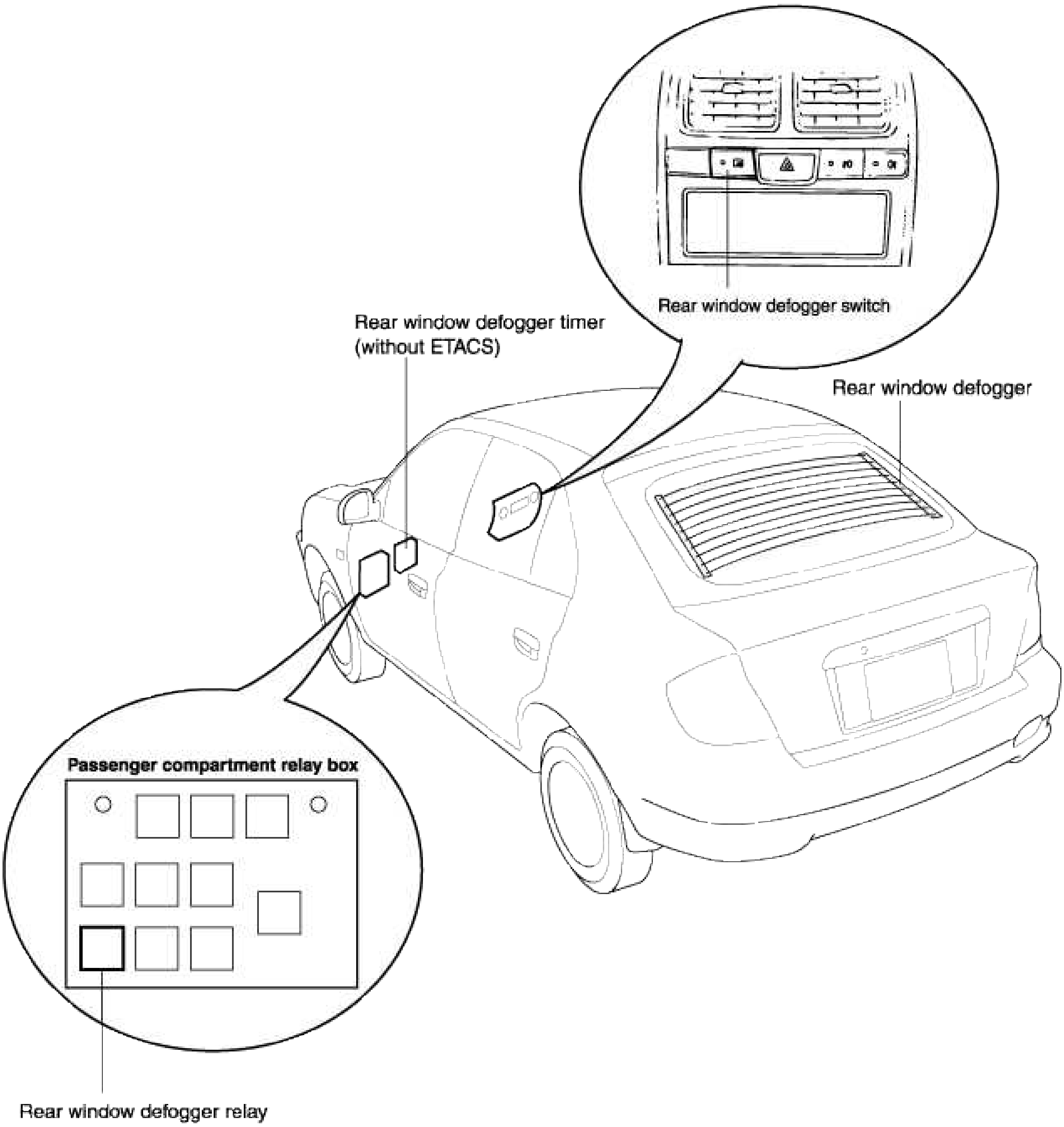


[D15]

Position \ Terminal	1	3	4	6	8
UP	○			○	
		○			○
OFF		○			○
	○		○		
DOWN		○		○	
	○		○		

Body Electrical System > Rear Window Defogger > Components and Components Location

COMPONENTS

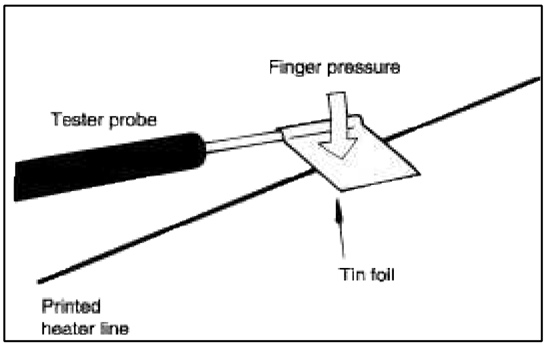

Rear window defogger switch
Rear window defogger timer (without ETACS)
Rear window defogger
Passenger compartment relay box
Rear window defogger relay

Body Electrical System > Rear Window Defogger > Rear Window Defogger Printed Heater > Repair procedures

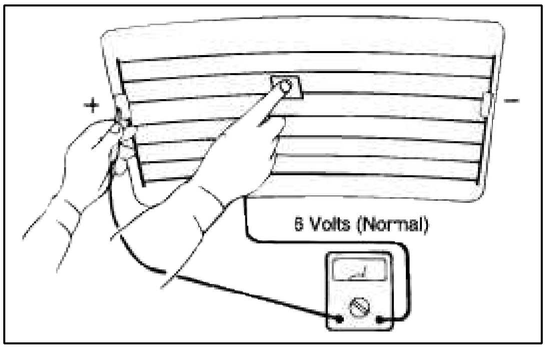
INSPECTION

CAUTION

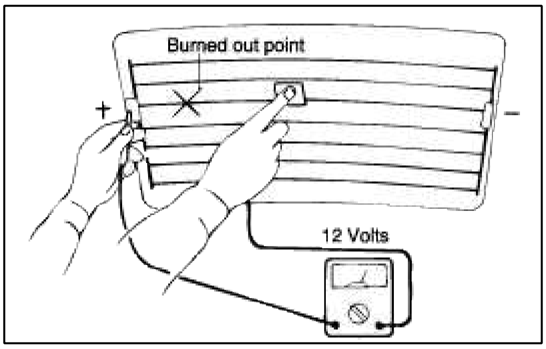
Wrap tin foil around the end of the voltmeter test lead to prevent damaging the heater line. Apply finger pressure on the tin foil, moving the tin foil along the grid line to check for open circuits.


Finger pressure
Tester probe
Tin foil
Printed heater line

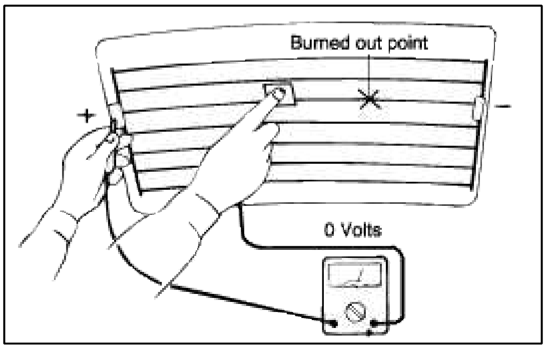
1. Turn on the defogger switch and use a voltmeter to measure the voltage of each heater line at the glass center point. If a voltage of approximately 6V is indicated by the voltmeter, the heater line of the rear window is considered satisfactory.


+
-
6 Volts (Normal)

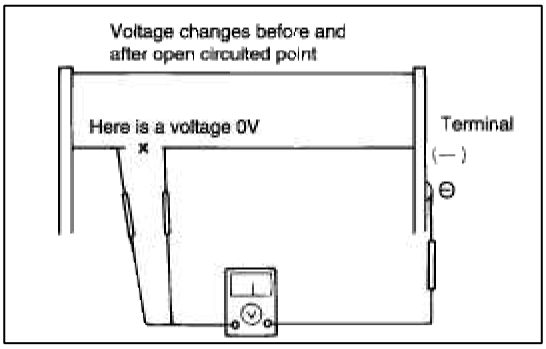
2. If a heater line is burned out between the center point and (+) terminal, the voltmeter will indicate 12V.


Burned out point
+
-
12 Volts

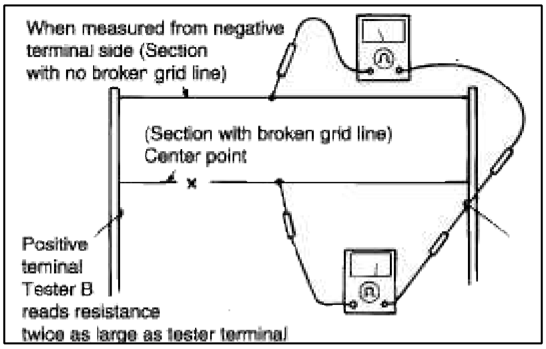
3. If a heater line is burned out between the center point and (-) terminal, the voltmeter will indicate 0V.


Burned out point
+
-
0 Volts

4. To check for open circuits, slowly move the test lead in the direction that the open circuit seems to exist. Try to find a point where a voltage is generated or changes to 0V. The point where the voltage has changed is the open-circuit point.


Voltage changes before and after open circuited point
Here is a voltage 0V
Terminal
(−)
⊖

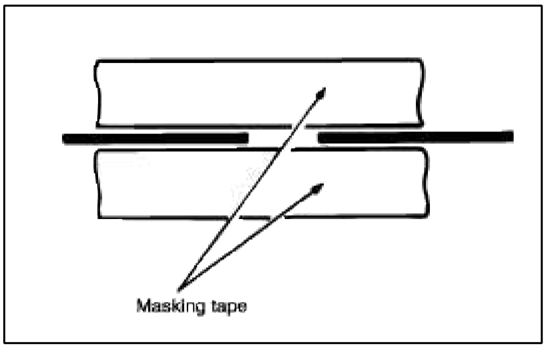
5. Use an ohmmeter to measure the resistance of each heater line between a terminal and the center of a grid line, and between the same terminal and the center of one adjacent heater line. The section with a broken heater line will have a resistance twice as that in other sections. In the affected section, move the test lead to a position where the resistance sharply changes.


When measured from negative terminal side (Section with no broker grid line)
(Section with broken grid line) Center point
Positive terminal
Tester B reads resistance twice as large as tester terminal

REPAIR OF BROKEN HEATER LINE

Prepare the following items :

1. Conductive paint.
2. Paint thinner.
3. Masking tape.
4. Silicone remover.
5. Using a thin brush :
   Wipe the glass adjacent to the broken heater line, clean with silicone remover and attach the masking tape as shown. Shake the conductive paint container well, and apply three coats with a brush at intervals of about 15 minutes apart. Remove the tape and allow sufficient time for drying before applying power. For a better finish, scrape away excess deposits with a knife after the paint has completely dried. (Allow 24 hours).

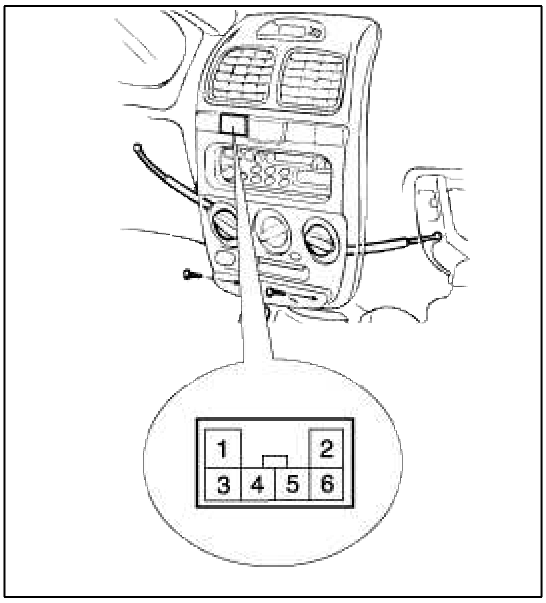

Masking tape

Body Electrical System > Rear Window Defogger > Rear Window Defogger Switch > Repair procedures

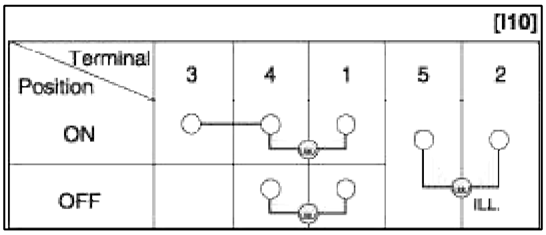
INSPECTION

1. Remove the negative(-) battery terminal.

2. Disconnect the switch connector after removing the center facia panel.

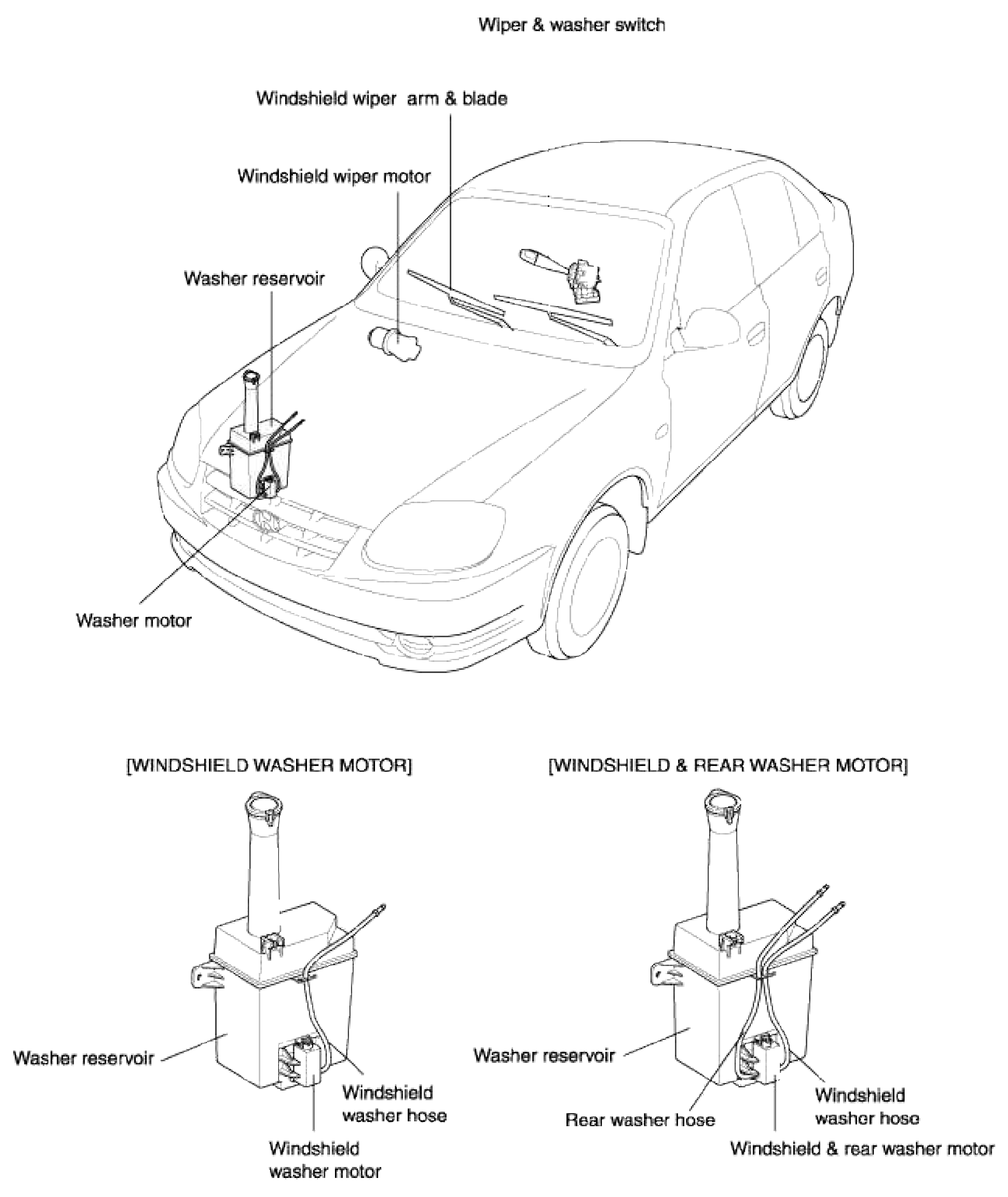


3. Check for continuity between the terminals. If continuity is not as specified in the table, replace the defogger switch.


[I10]
Terminal
Position
3
4
1
5
2
ON
OFF
ILL.

Body Electrical System > Windshield Wiper/Washer > Components and Components Location

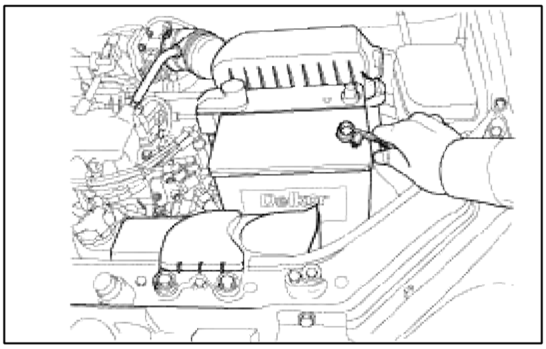
COMPONENTS


Wiper & washer switch
Windshield wiper arm & blade
Windshield wiper motor
Washer reservoir
Washer motor
[WINDSHIELD WASHER MOTOR]
Washer reservoir
Windshield washer hose
Windshield washer motor
[WINDSHIELD & REAR WASHER MOTOR]
Washer reservoir
Rear washer hose
Windshield washer hose
Windshield & rear washer motor

Body Electrical System > Windshield Wiper/Washer > Windshield Wiper/Washer Switch > Repair procedures

REMOVAL AND INSTALLATION

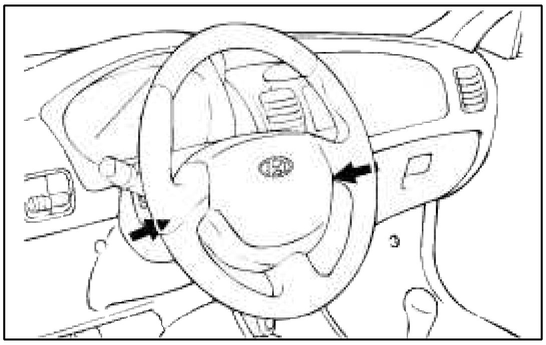
1. Disconnect the negative(-) battery terminal.



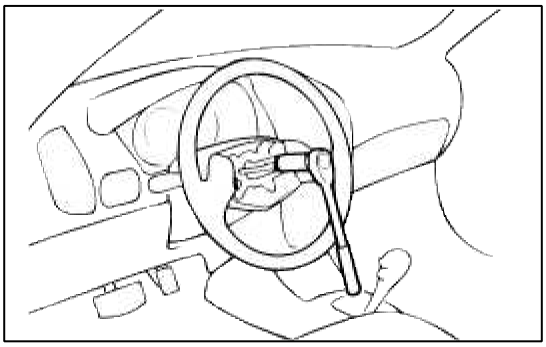
2. Remove the 2 bolts and disconnect the airbag connector and the horn connector, then remove the airbag module.

CAUTION

Remove the horn pad only for vehicle without airbag.



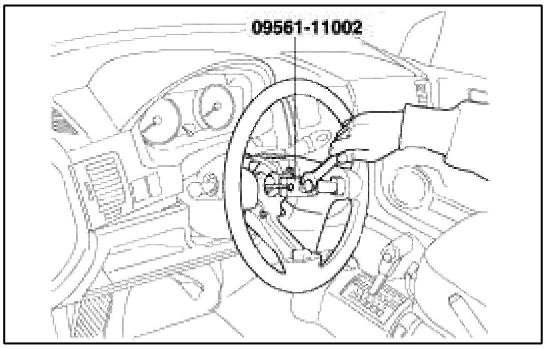
3. Remove the steering wheel lock nut.



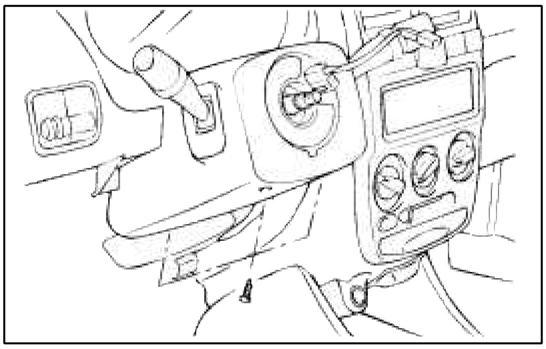
4. Remove the steering wheel with special tool (09561-11002).

CAUTION

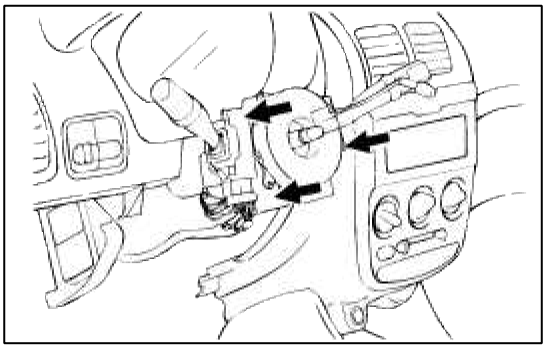
Do not hammer on the steering wheel to remove it. Doing so may damage the collapsible mechanism.



5. Remove the steering column shroud after removing 3 screws.

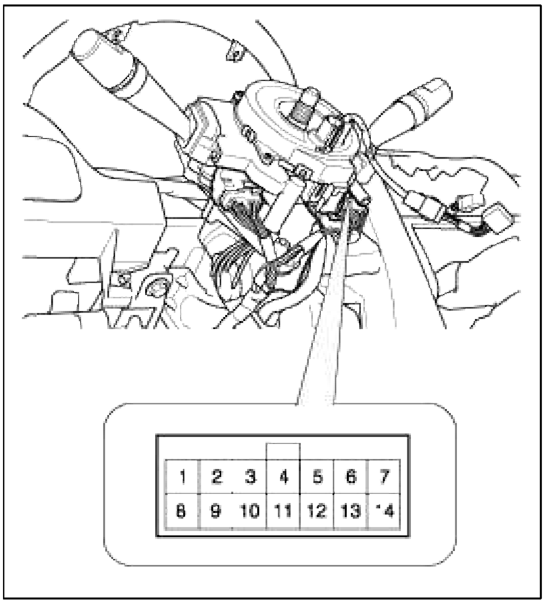


6. Disconnect the wire connectors and remove the multi-function switch after removing the screws.



7. Installation is the reverse of removal.

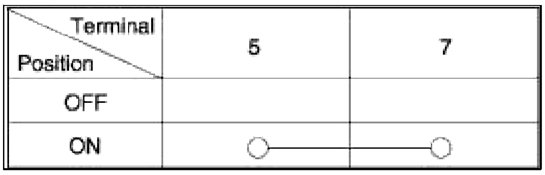
INSPECTION



WIPER SWITCH [M10-1]

Position \ Terminal	1	2	3	4	5	6	13	14
MIST				○	○			
OFF		○	○					
INT		○	○		○	○	○	○
LOW		○			○			
HI	○				○			

WASHER SWITCH [M10-1]

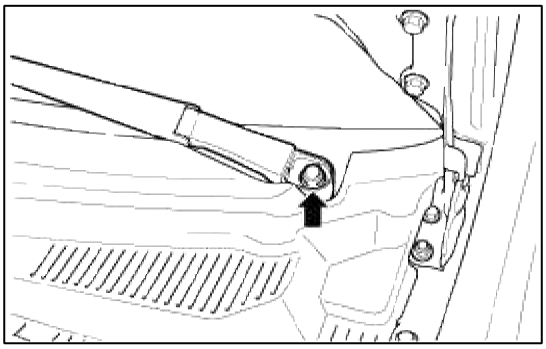


Terminal Position	5	7
OFF		
ON	○	○

Body Electrical System > Windshield Wiper/Washer > Front Wiper Motor > Repair procedures

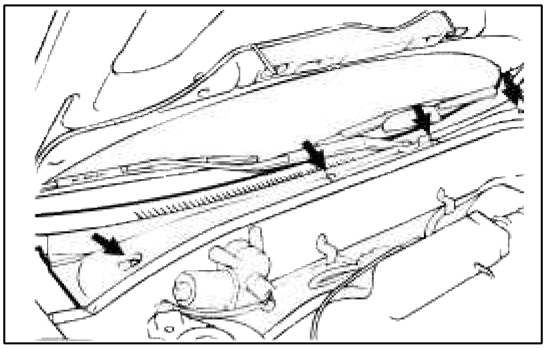
REMOVAL

1. Remove the windshield wiper arm and blade after removing a nut.

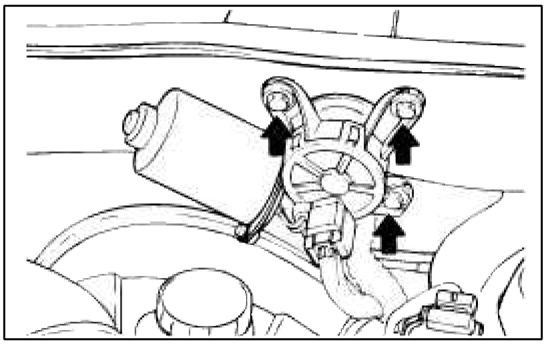


Tightening torque
18~23 Nm (180~230 kg·cm, 13.1~16.8 lb·ft)

2. Remove the weatherstrip and cowl top cover after removing 4 clips.

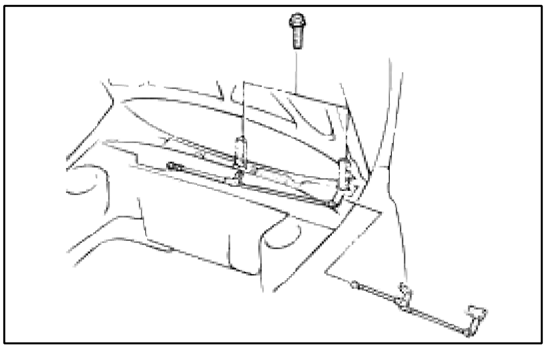


3. Remove the windshield wiper motor after removing 3 bolts.



Tightening torque
7~11 Nm (70~110 kg·cm, 5.1~8.0 lb·ft)

4. Remove the wiper link mounting bolts and take out the wiper link assembly from the cowl top panel.



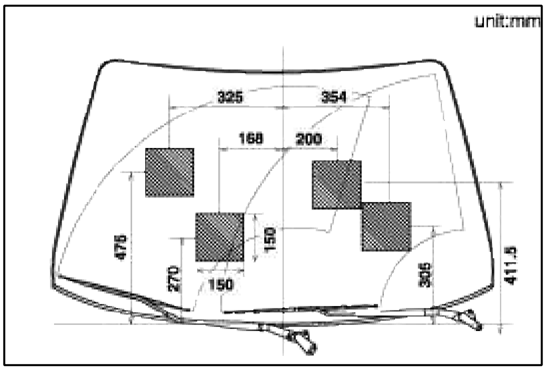
5. Installation is the reverse of removal.

INSTALLATION

1. Install the wiper arm and blade to the specified position.

Specified position	A	B
Distance (mm)	25~35	25~35

2. Set the washer nozzle on the specified spray position.

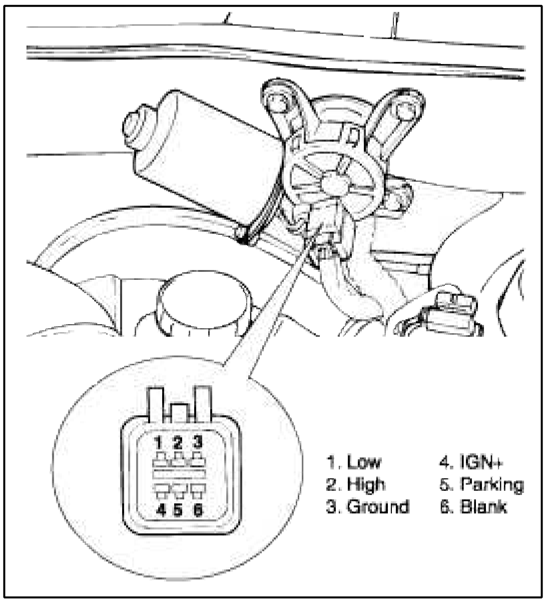


INSPECTION

SPEED OPERATION CHECK

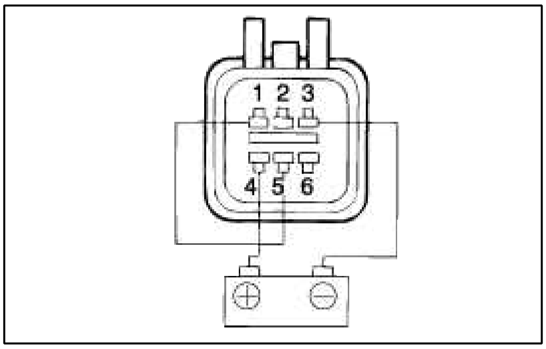
1. Remove the connector from the wiper motor.
2. Attach the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 3.
3. Check that the motor operates at low speed.
4. Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 3.

5. Check that the motor operates at high speed.



AUTOMATIC STOP OPERATION CHECK

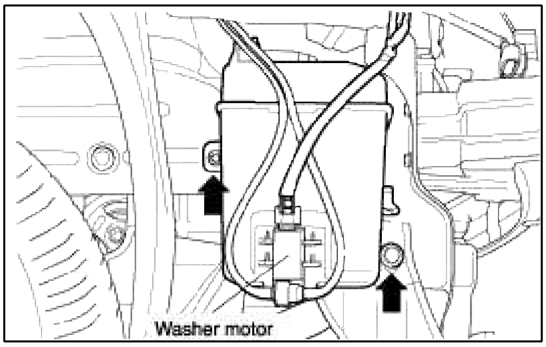
1. Operate the motor at low speed using the stalk control.
2. Stop the motor operation anywhere except at the off position by disconnecting terminal 1
3. Connect terminals 1and 5.
4. Connect the positive (+) lead from the battery to terminal 4 and the negative (-) lead to terminal 3.
5. Check that the motor stops running at the off position.



Body Electrical System > Windshield Wiper/Washer > Front Washer Motor > Repair procedures

REMOVAL AND INSTALLATION

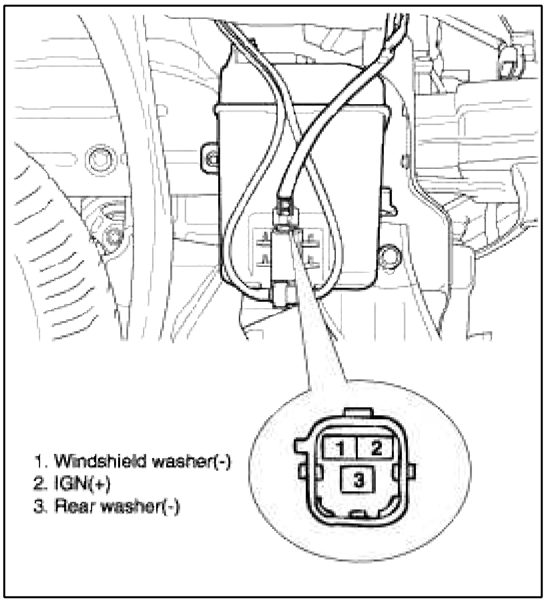
1. Disconnect the negative(-) battery terminal.
2. Remove the front bumper cover. (Refer to BD group)
3. Remove the washer hose and the washer motor connector.
4. Remove the washer reservoir after removing 2 bolts.

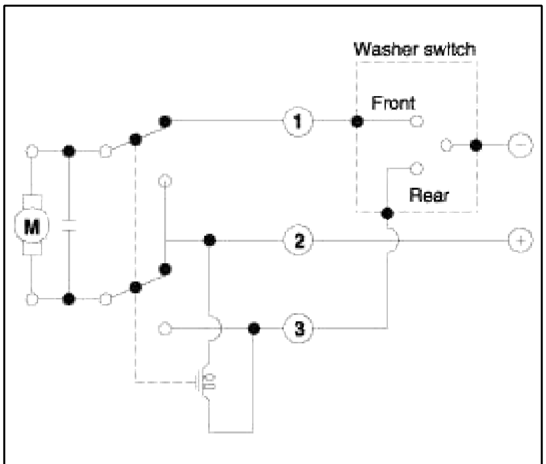


5. Installation is the reverse of removal.

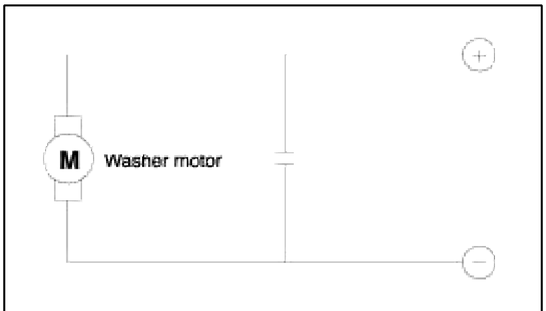
INSPECTION

1. With the washer motor connected to the reservoir tank, fill the reservoir tank with water.
2. Connect positive (+) and negative (-) battery cables to terminals 2 and 1 respectively to see that the washer motor runs and water sprays from the front nozzles.
3. Check that the motor operates normally.


1. Windshield washer(-)
2. IGN(+)
3. Rear washer(-)
1
2
3


Washer switch
Front
Rear
M
1
2
3

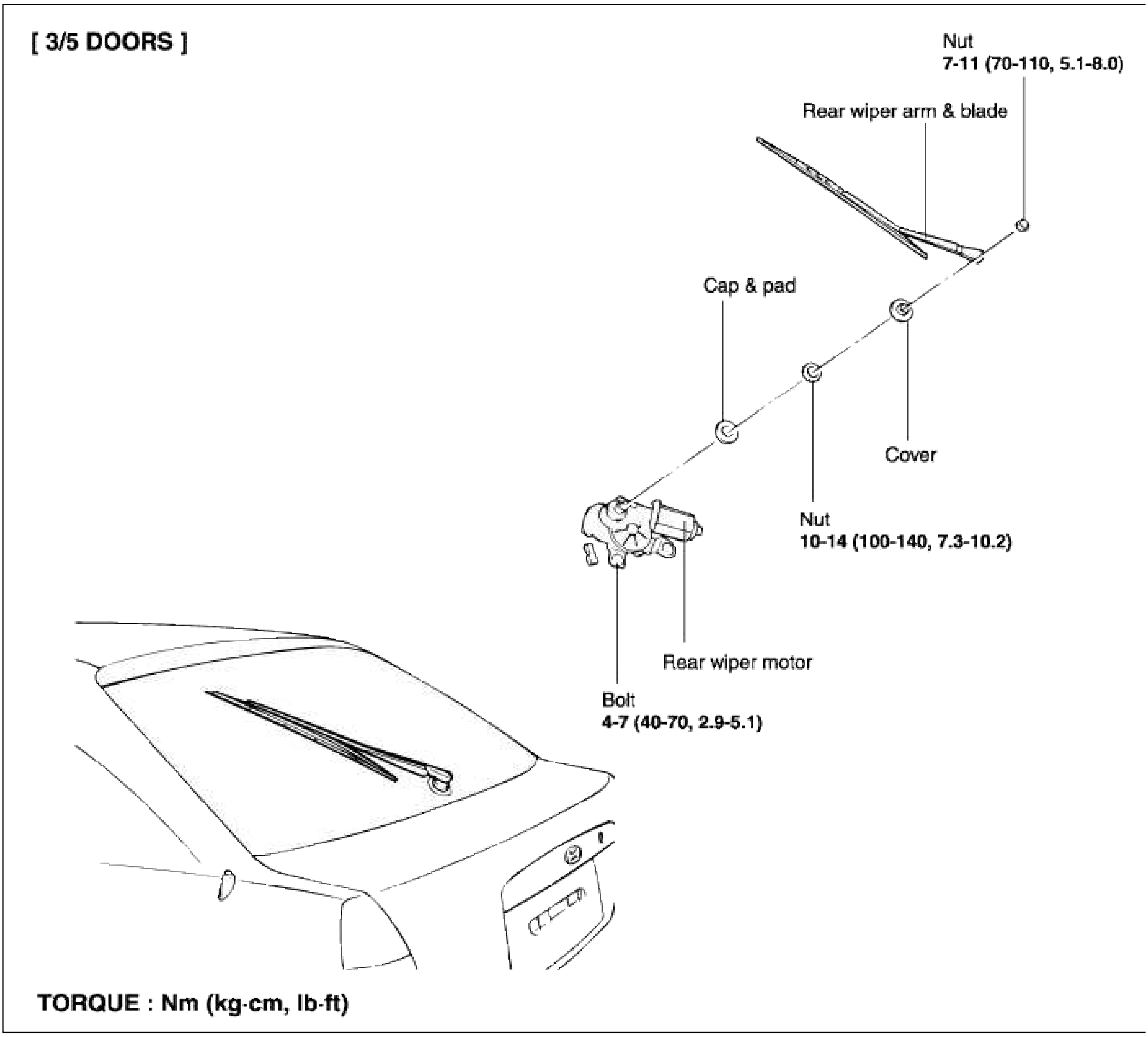
<Windshield & rear washer motor>


M
Washer motor

<Windshield washer motor>

Body Electrical System > Rear Wiper/Washer > Rear Wiper Motor > Components and Components Location

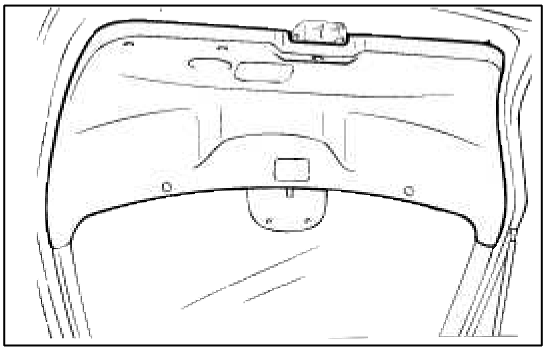
COMPONENTS


[3/5 DOORS]
Nut
7-11 (70-110, 5.1-8.0)
Rear wiper arm & blade
Cap & pad
Cover
Nut
10-14 (100-140, 7.3-10.2)
Rear wiper motor
Bolt
4-7 (40-70, 2.9-5.1)
TORQUE : Nm (kg·cm, lb·ft)

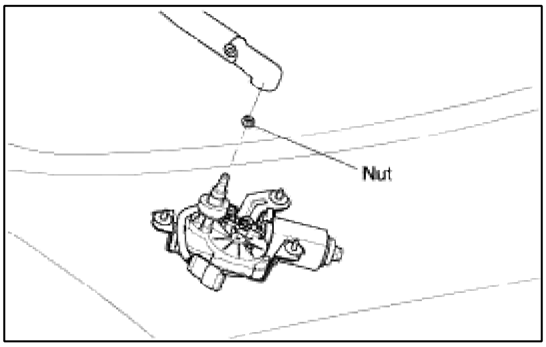
Body Electrical System > Rear Wiper/Washer > Rear Wiper Motor > Repair procedures

REMOVAL

1. Remove the tailgate trim panel.



2. Remove the rear wiper arm after removing a nut.

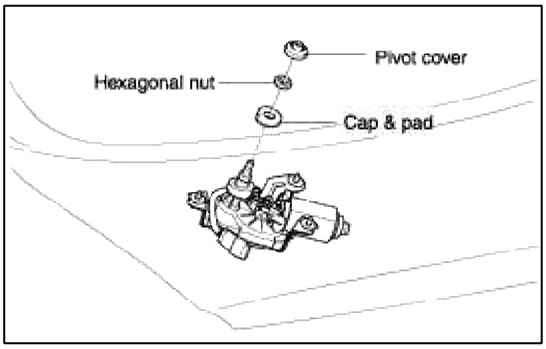


Tightening torque
7~11 Nm (70~110 kg·cm, 5.1~8.0 lb·ft)

3. Remove a hexagonal nut after removing a pivot cover.

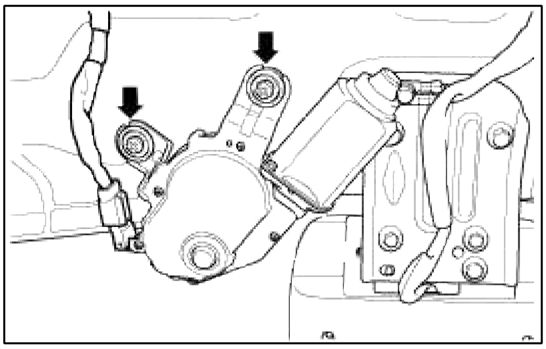
NOTE

When installing cap & pad, the arrow mark should be indicated upward.



Tightening torque
10~14 Nm (100~140 kg·cm, 7.3~10.2 lb·ft)

4. Remove the rear wiper motor after removing 2 bolts and disconnect the wire connector.



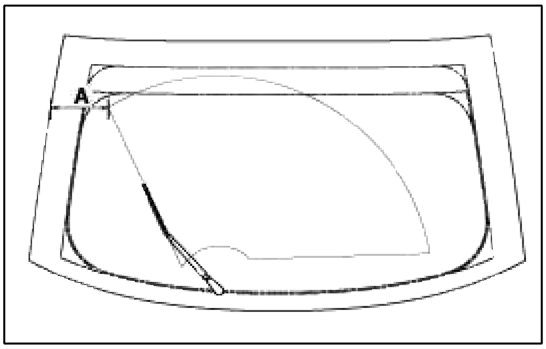
Tightening torque
4~7 Nm (40~70 kg·cm, 2.9~5.1 lb·ft)

5. Installation is the reverse of removal.

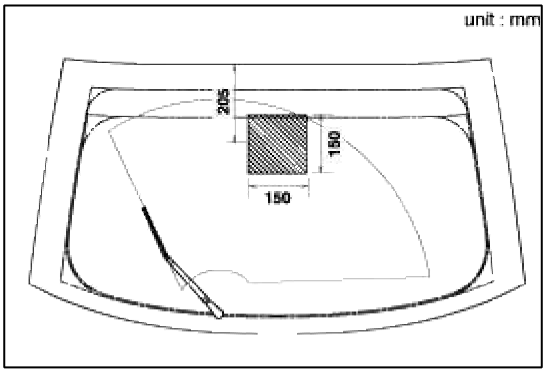
INSTALLATION

1. Install the rear wiper arm and blade to the specified position.

Specified position	**A**
Distance	150±10 mm

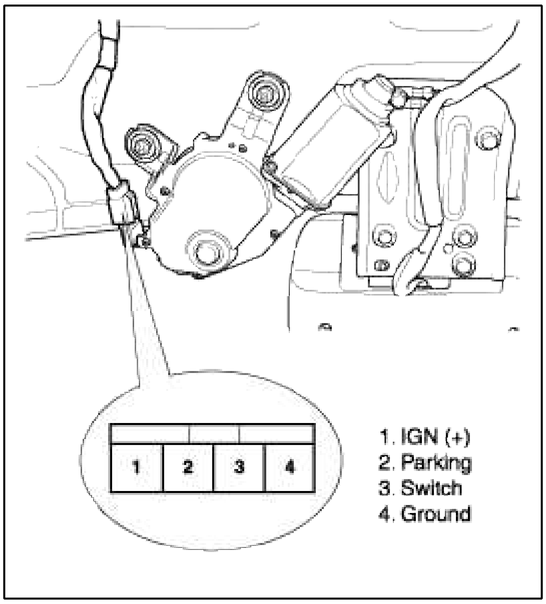


2. Set the rear washer nozzle on the specified spray position.



INSPECTION

1. Remove the connector from the rear wiper motor.
2. Connect battery positive (+) and negative (-) cables to terminals 1 and 4 respectively.
3. Check that the motor operates normally. Replace the motor if it operates abnormally.

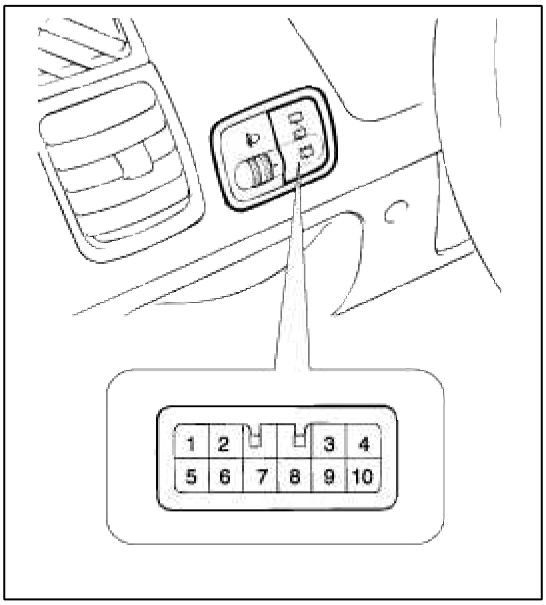


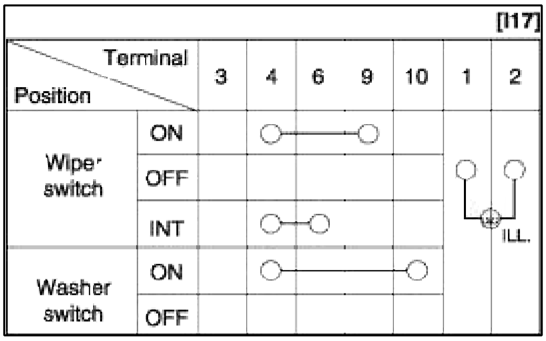
Body Electrical System > Rear Wiper/Washer > Rear Washer Switch > Repair procedures

INSPECTION

1. Disconnect the connector from the rear wiper and washer switch.

2. Check for continuity between the terminals.



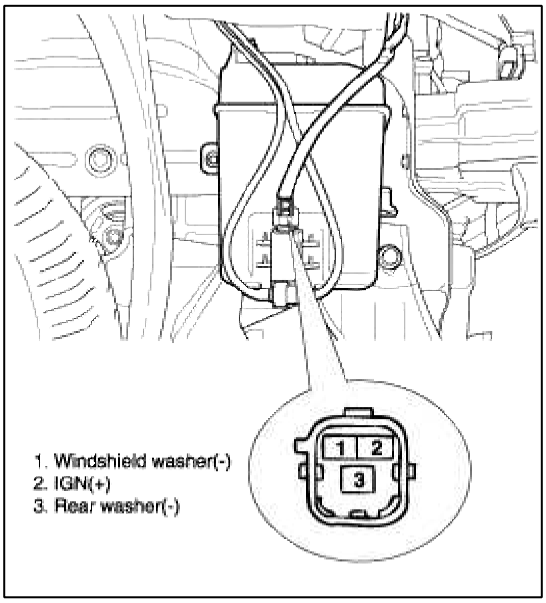

[I17]

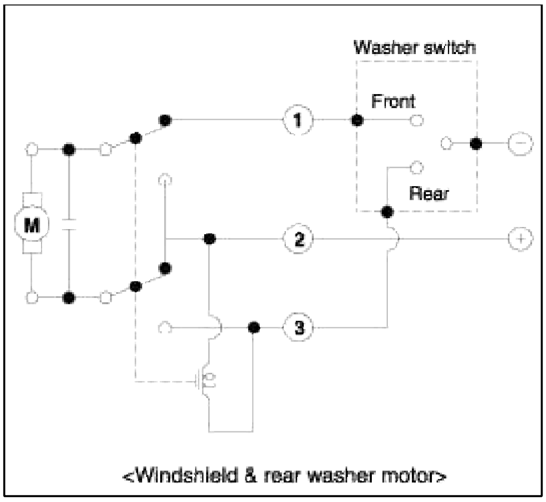
Position		3	4	6	9	10	1	2
Wiper switch	ON		○	─	○			
	OFF						○	○
	INT		○	○			ILL.	ILL.
Washer switch	ON		○	─	─	○		
	OFF							

Body Electrical System > Rear Wiper/Washer > Rear Washer Motor > Repair procedures

INSPECTION

1. With the washer motor connected to the reservoir tank, fill the reservoir tank with water.
2. Connect positive(+) and negative(-) battery cables to terminals 2 and 3 respectively to see that the washer motor runs and water is pumped.
3. Check that the motor operates normally.
   Replace the motor if it operates abnormally.

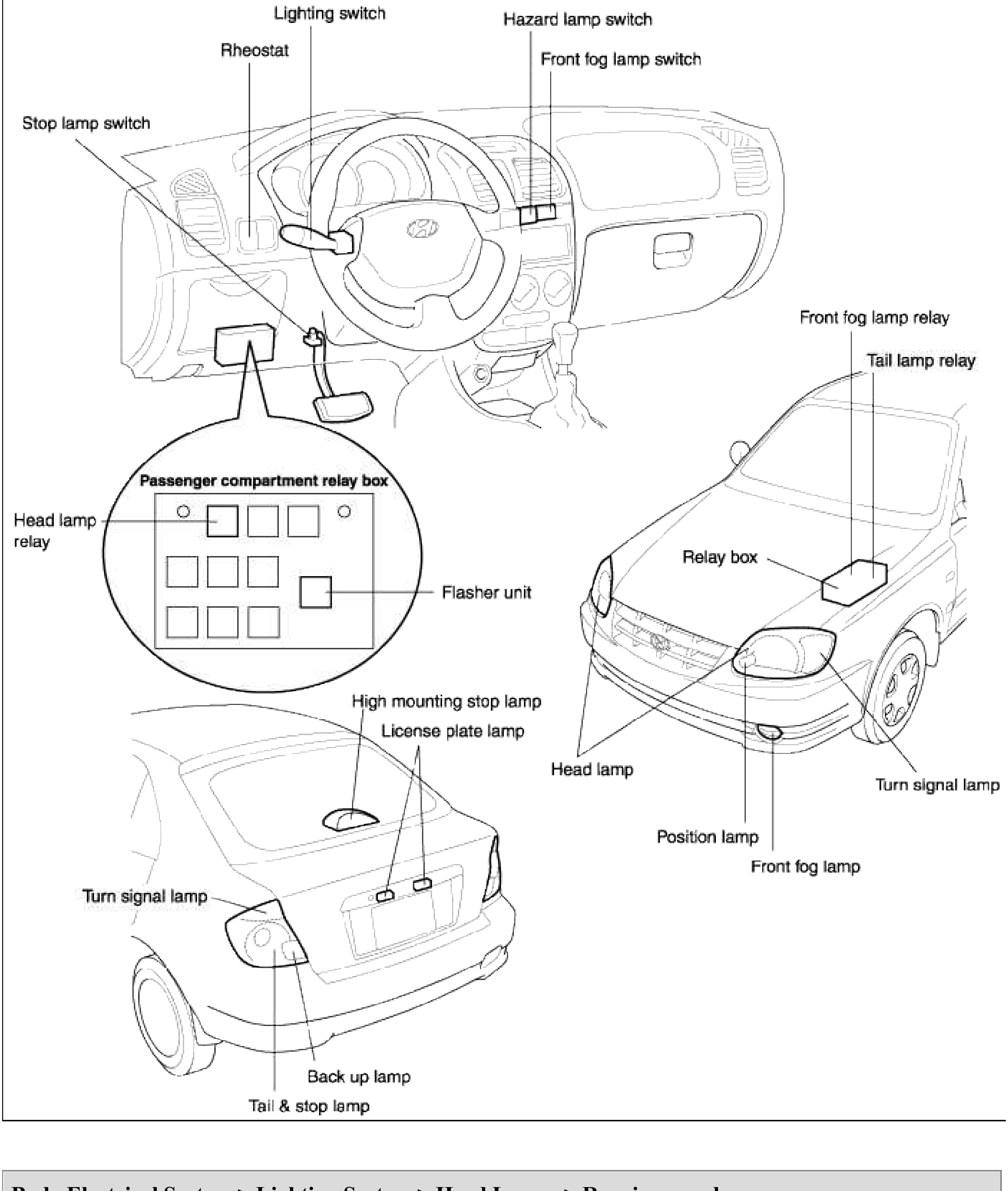



Washer switch
Front
Rear
M
1
2
3

<Windshield & rear washer motor>

Body Electrical System > Lighting System > Components and Components Location

COMPONENTS

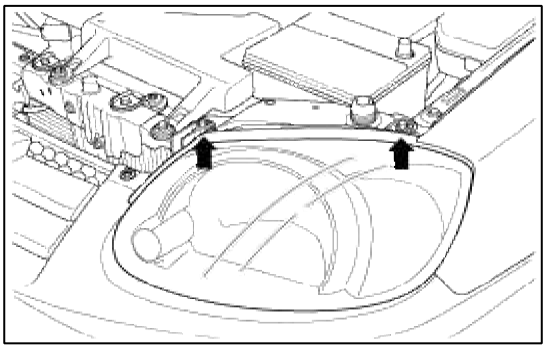

Lighting switch
Hazard lamp switch
Rheostat
Front fog lamp switch
Stop lamp switch
Front fog lamp relay
Tail lamp relay
Passenger compartment relay box
Head lamp relay
Relay box
Flasher unit
High mounting stop lamp
License plate lamp
Head lamp
Turn signal lamp
Position lamp
Front fog lamp
Turn signal lamp
Back up lamp
Tail & stop lamp

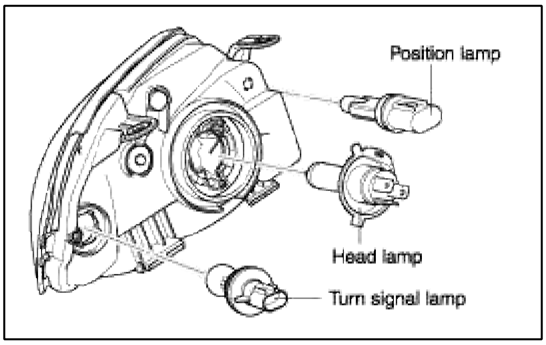
Body Electrical System > Lighting System > Head Lamps > Repair procedures

REMOVAL AND INSTALLATION

1. Disconnect the negative(-) battery terminal.

2. Remove the head lamp mounting bolts (2EA), then disconnect the lamp connectors.





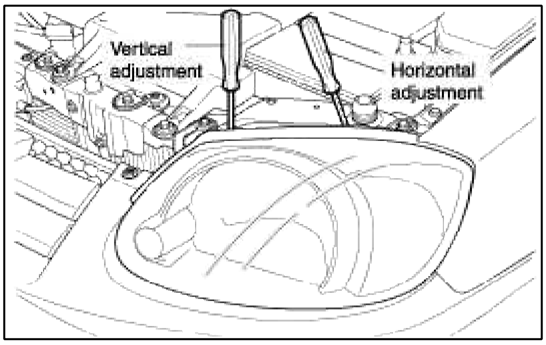
3. Installation is the reverse of removal.

AIMING INSTRUCTIONS

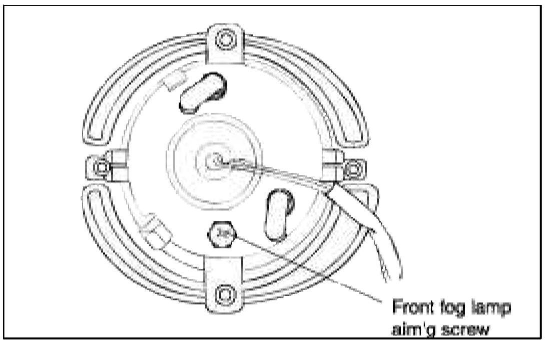
HEAD LAMP AIMING

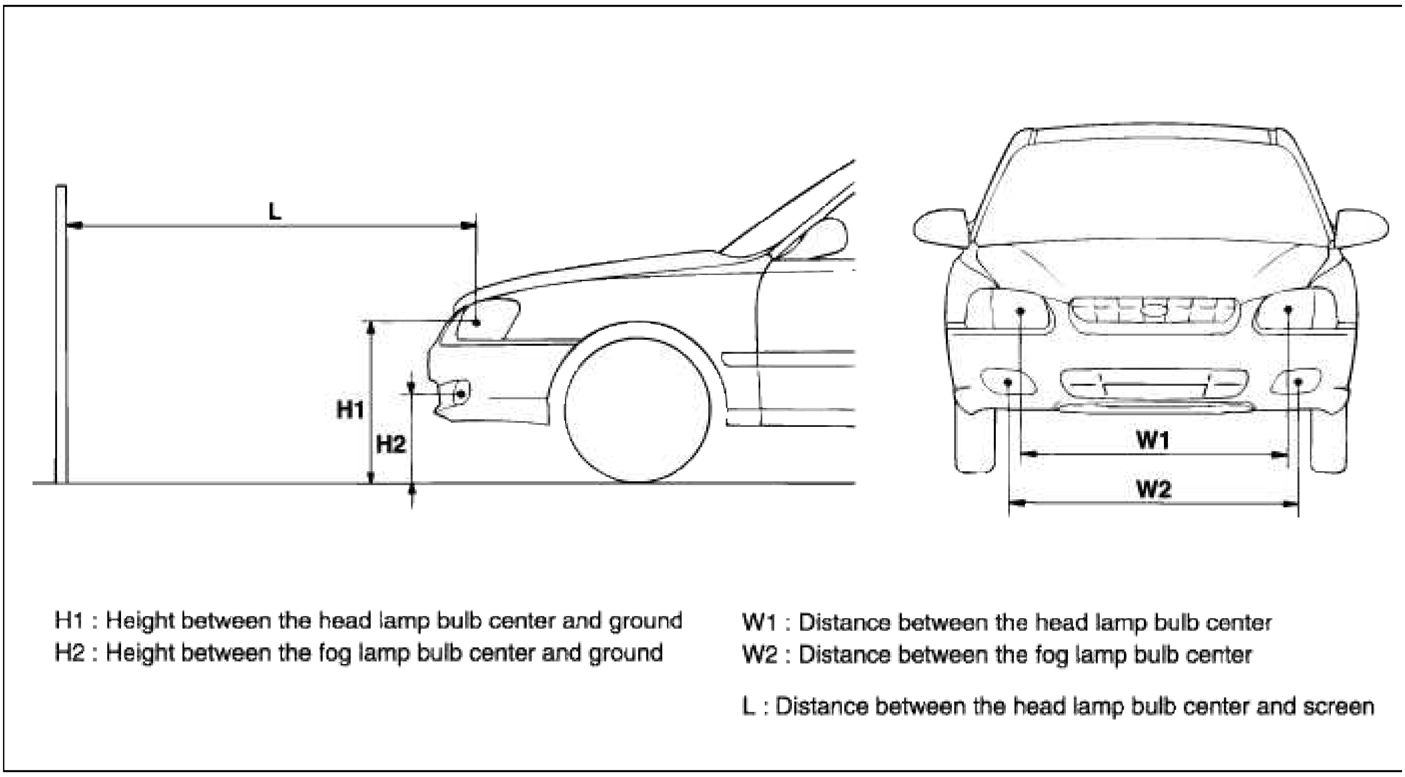
> **NOTE**
>
> If there are any regulations pertinent to the aiming of head lamps in the area where the vehicle is to be used, adjust so as to meet those requirements.

1. Inflate the tires to the specified pressure and remove any loads from the vehicle except the driver, spare tire, and tools.
2. The vehicle should be placed on a flat floor.
3. Draw vertical lines (Vertical lines passing through respective head lamp centers) and a horizontal line (Horizontal line passing through center of head lamps) on the screen.
4. With the head lamp and battery in normal condition, aim the head lamps so the brightest portion falls on the horizontal and vertical lines.
   Make vertical and horizontal adjustments to the lower beam using the adjusting wheel.



FRONT FOG LAMP AIMING





H1 : Height between the head lamp bulb center and ground
H2 : Height between the fog lamp bulb center and ground

W1 : Distance between the head lamp bulb center
W2 : Distance between the fog lamp bulb center

L : Distance between the head lamp bulb center and screen

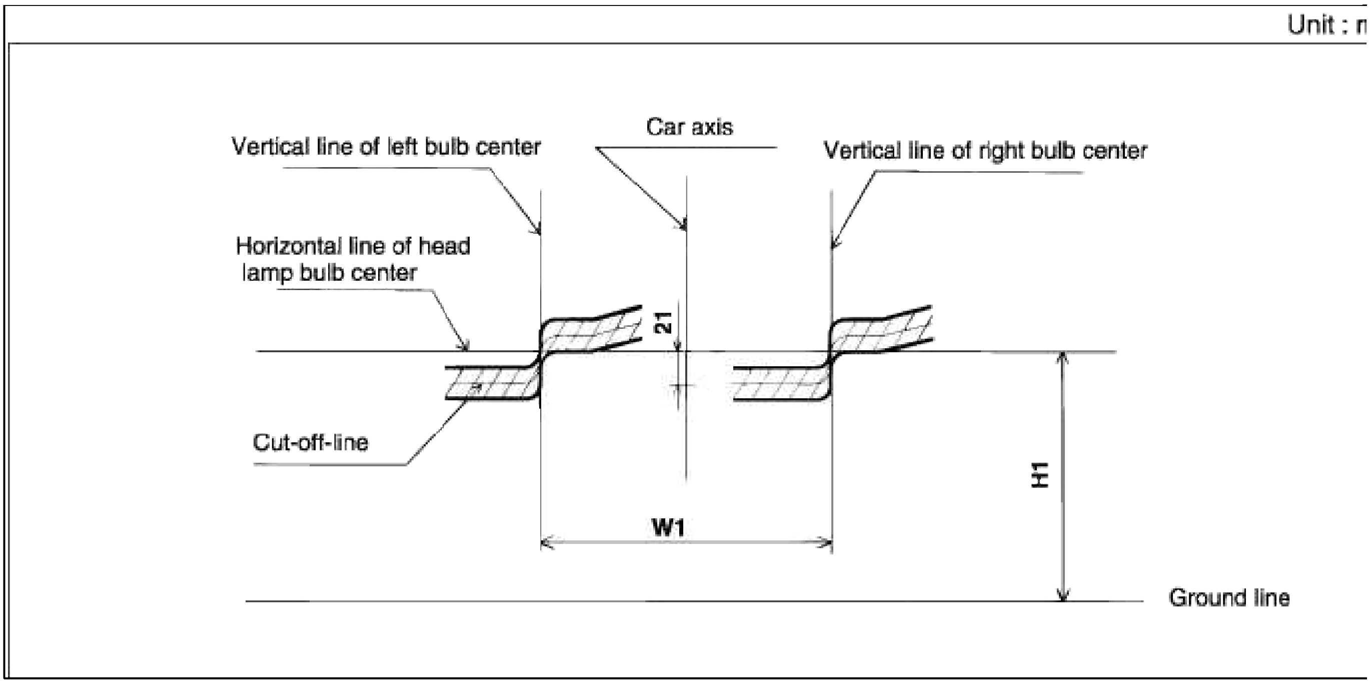
HEAD LAMP AND FOG LAMP AIMING POINT

1. Turn the low beam on without driver aboard.

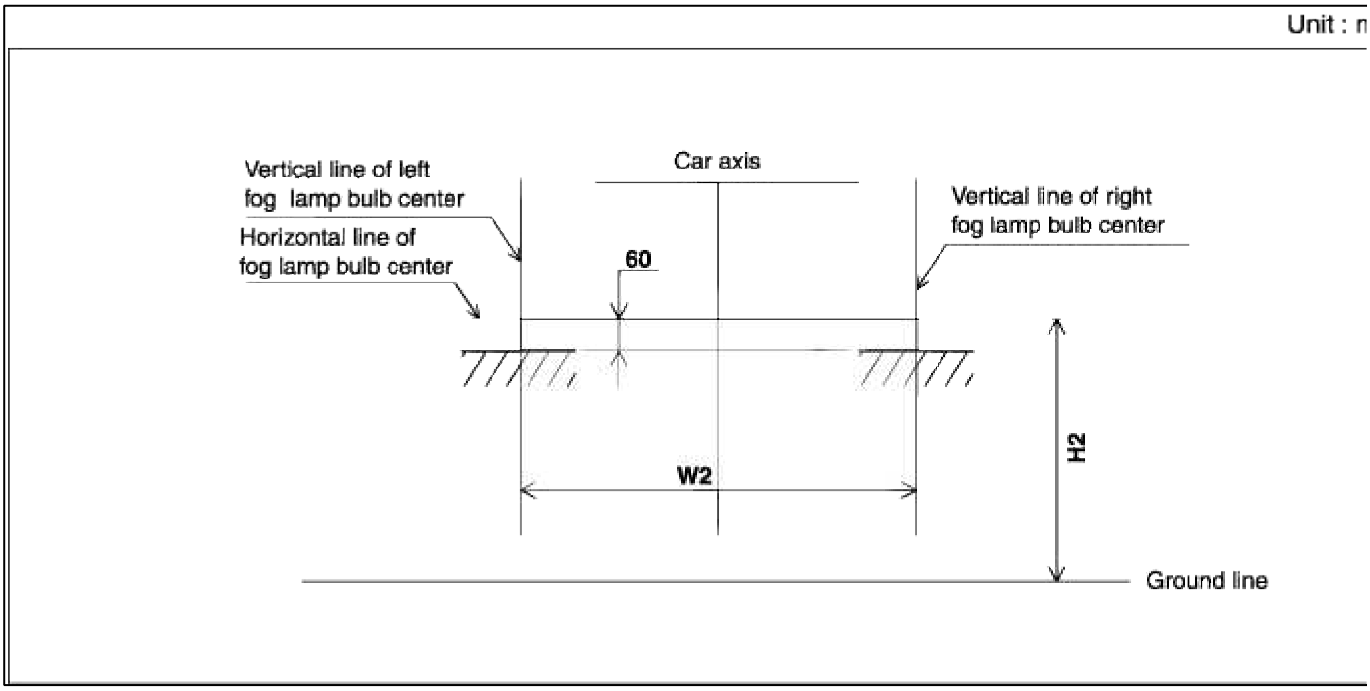
Unit : m

Vehicle condition	H1	H2	W1	W2	L
Without driver	665	340	1,078	1,134	3,000
With driver	656	331			

The cut-off line should be projected in the allowable range (shaded region).


Unit :
Car axis
Vertical line of left bulb center
Vertical line of right bulb center
Horizontal line of head lamp bulb center
21
Cut-off-line
H1
W1
Ground line

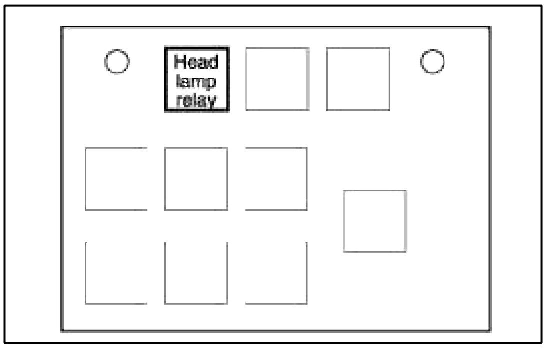
2. Turn the front fog lamp on without driver aboard.
The cut-off line should be projected in the allowable range (shaded region).


Unit :
Car axis
Vertical line of left fog lamp bulb center
Horizontal line of fog lamp bulb center
Vertical line of right fog lamp bulb center
60
H2
W2
Ground line

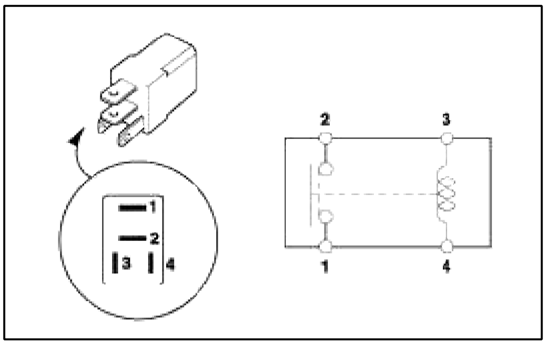
INSPECTION

HEAD LAMP RELAY

1. Pull out the headlamp relay from the relay box in the passenger compartment.


Head lamp relay

2. Check for continuity between terminals.

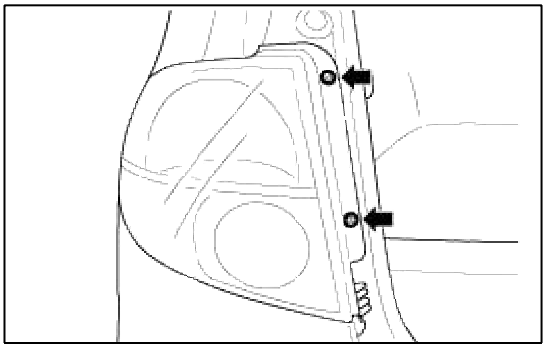


Position \ Terminal	1	2	3	4
When de-energized			○—	—○
When energized	○—	—○	⊖—	—⊕

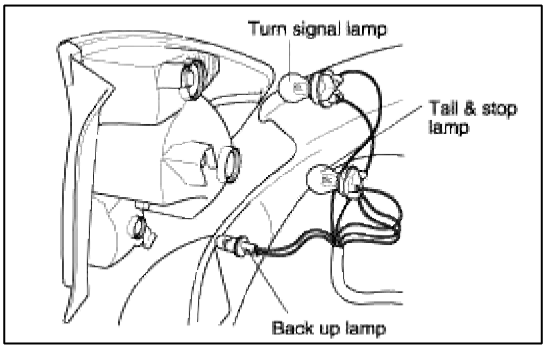
Body Electrical System > Lighting System > Turn Signal Lamp > Repair procedures

REMOVAL AND INSTALLATION

1. Disconnect the negative(-) battery terminal.
2. Remove the 2 screws holding the rear combination lamp.



3. Disconnect the wire connector from the rear combination lamp.



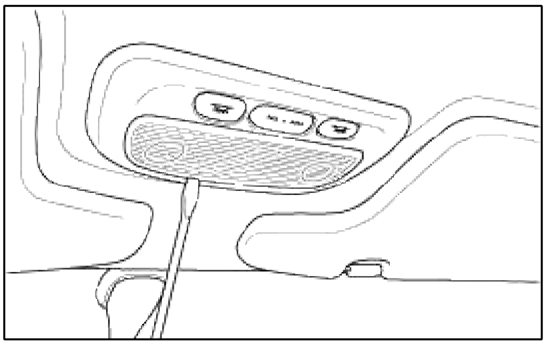
4. Installation is the reverse of removal.

Body Electrical System > Lighting System > Room Lamp > Repair procedures

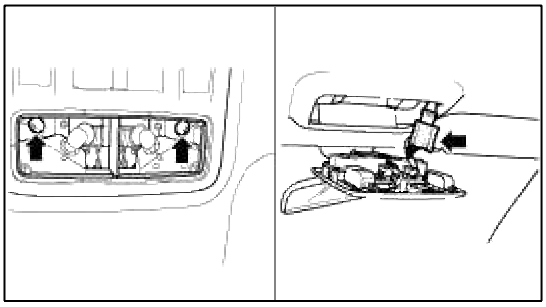
REMOVAL AND INSTALLATION

1. Disconnect the negative(-) battery terminal.

2. Detach the lamp lens from the room lamp with a flat-tip screwdriver.

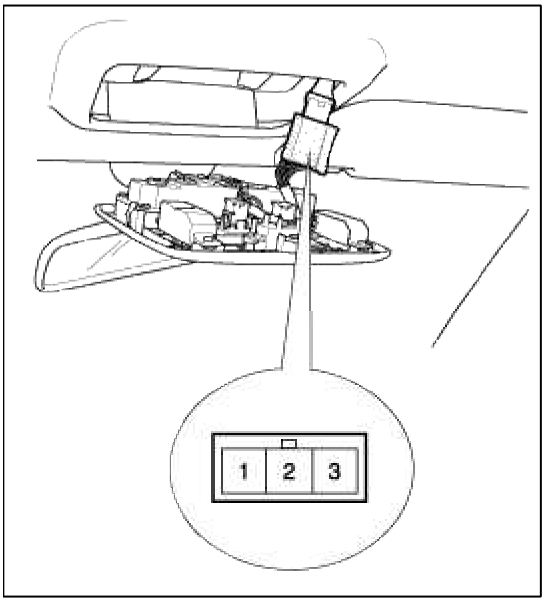


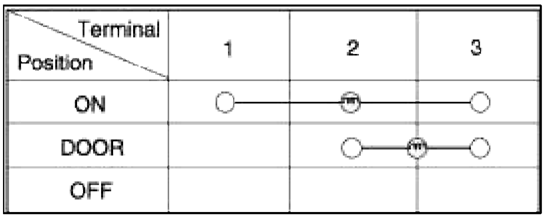
3. Remove the mounting screws (2EA) and disconnect the wire connector, then remove the room lamp assembly.



4. Installation is the reverse of removal.

INSPECTION





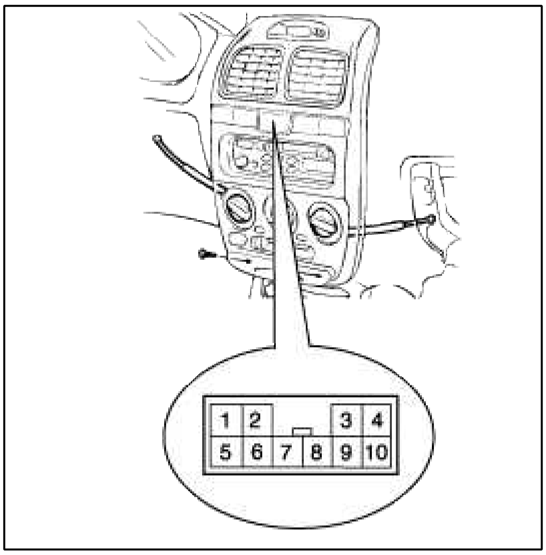
Terminal / Position	1	2	3
ON	○—	—⦶—	—○
DOOR		○—⦶	—○
OFF			

Body Electrical System > Lighting System > Hazard Lamp Switch > Repair procedures

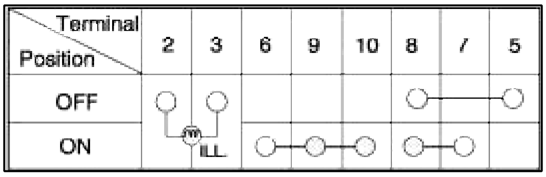
INSPECTION

1. Disconnect the negative(-) battery terminal.

2. Remove the center facia panel with a flat-tip screwdriver, then disconnect the switch connector.



3. Operate the switch and check for continuity between terminals with an ohmmeter.

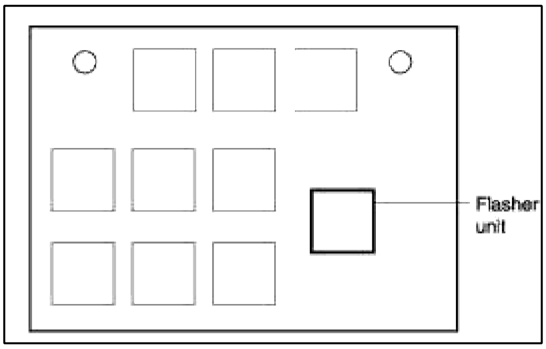


Terminal Position	2	3	6	9	10	8	7	5
OFF	○	○				○—	—	—○
ON		ILL	○—	—○—	—○	○—	—○	

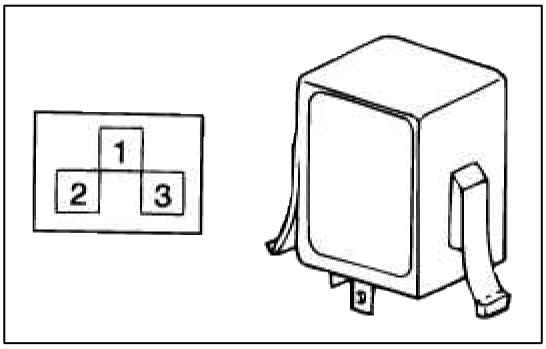
Body Electrical System > Lighting System > Flasher Unit > Repair procedures

INSPECTION

1. Remove the flasher unit from the passenger compartment relay box.



2. Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 3.



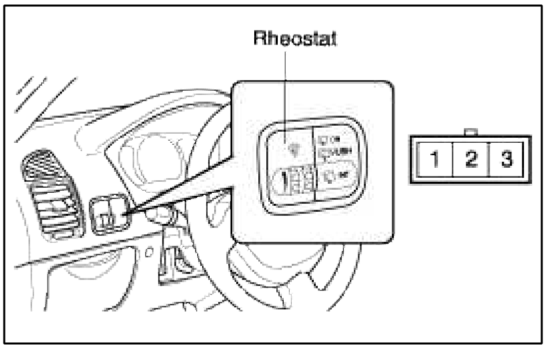
3. Connect the two turn signal lamps in parallel to terminal 1. Check that the bulbs turn on and off.

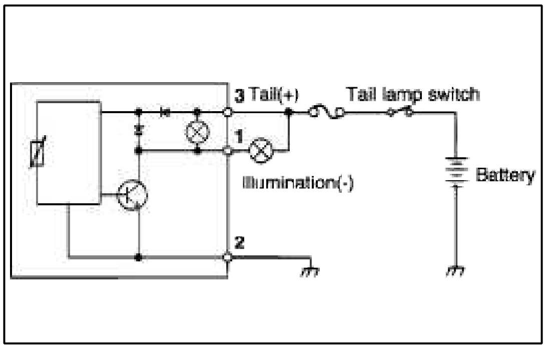
> **NOTE**
>
> The turn signal lamps should flash 60 to 120 times per minute. If one of the front or rear turn signal lamps has an open circuit, the number of flashes will be more than 120 per minute. If operation is not as specified, replace the flasher unit.

Body Electrical System > Lighting System > Rheostat > Repair procedures

INSPECTION

1. Disconnect the negative(-) battery terminal.
2. Detach the rheostat connector from the driver's crash pad panel.



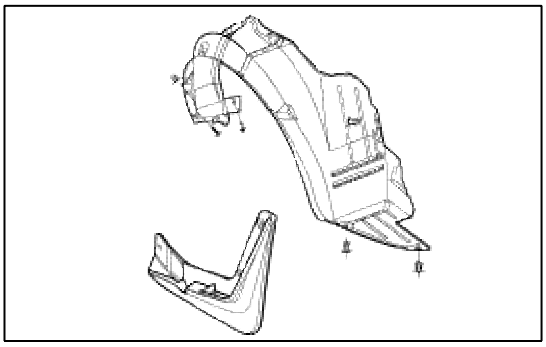


3. Check for intensity. If the light intensity of the lamps changes smoothly without any flickering when the rheostat is turned, it can be assumed that the rheostat is normal.

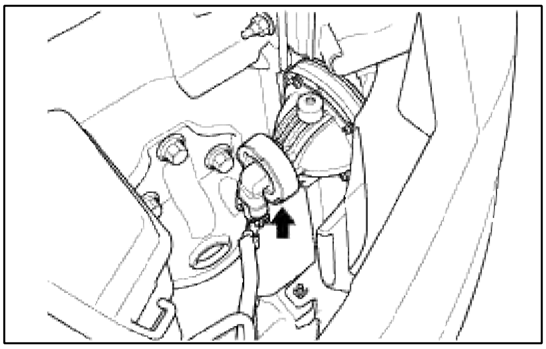
Body Electrical System > Lighting System > Front Fog Lamps > Repair procedures

REMOVAL AND INSTALLATION

1. Disconnect the negative(-) battery terminal.
2. Remove the front wheel guard.



3. Remove the front fog lamp assembly after removing the screws, then disconnect the wire connector.

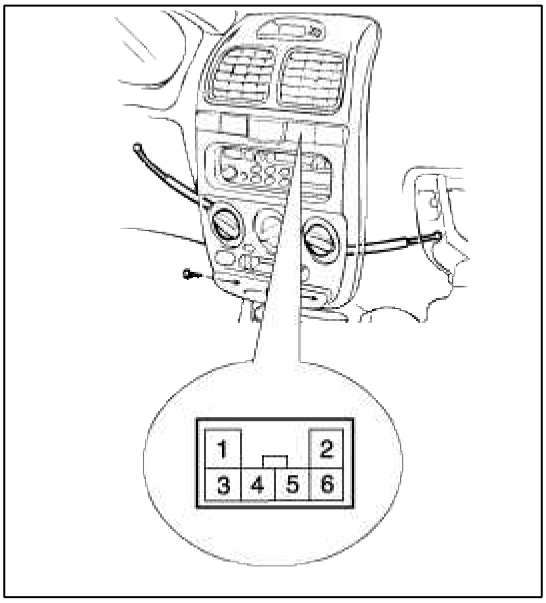


4. Installation is the reverse of removal.

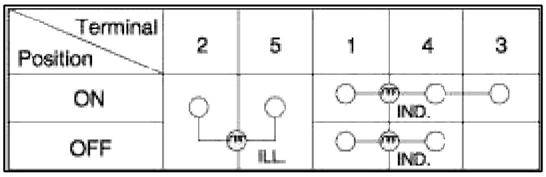
INSPECTION

FRONT FOG LAMP SWITCH

1. Disconnect the negative(-) battery terminal.
2. Remove the center facia panel with a flat-tip screwdriver, then disconnect the switch connector.



3. Operate the switch and check for continuity between terminals with an ohmmeter.

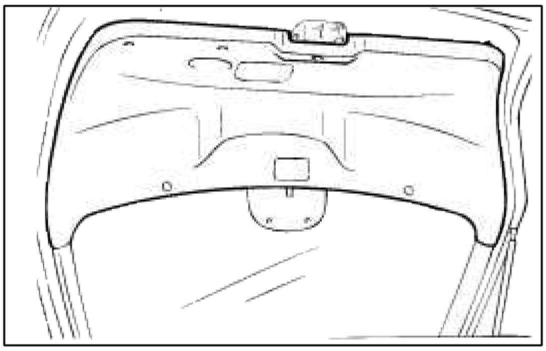


Terminal / Position	2	5	1	4	3
ON	○	○	○	○ IND.	○
OFF	○ ILL.	○	○	○ IND.	

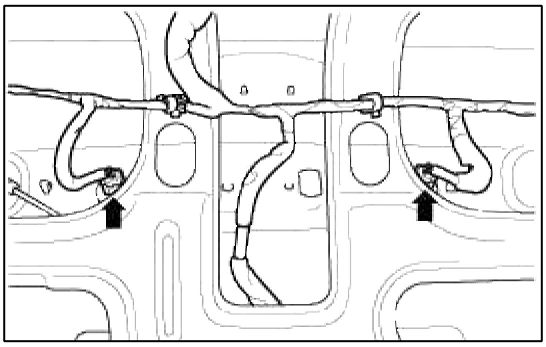
Body Electrical System > Lighting System > License Lamps > Repair procedures

REMOVAL AND INSTALLATION

1. Disconnect the negative (-) battery terminal.
2. Remove the tailgate trim.



3. Remove the license plate lamp and disconnect the wire connector.

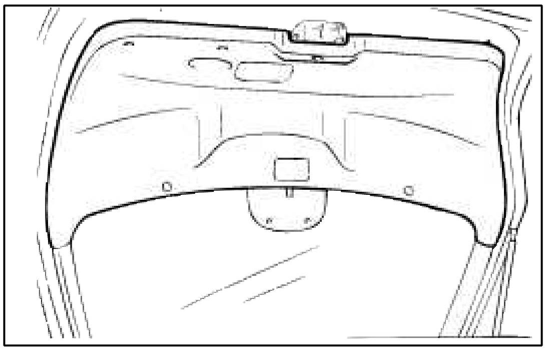


4. Installation is the reverse of removal.

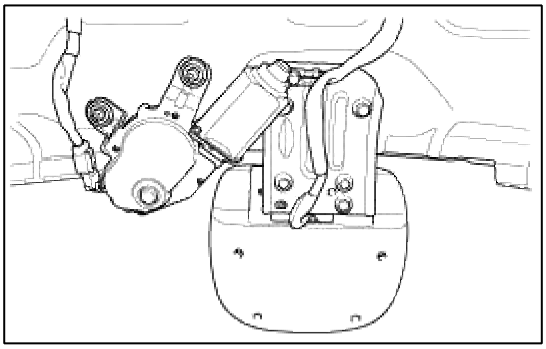
Body Electrical System > Lighting System > High Mounted stop lamp > Repair procedures

REMOVAL AND INSTALLATION

1. Disconnect the negative(-) battery terminal.
2. Remove the tailgate trim.



3. Remove the 5 bolts, disconnect the wire connector and then remove the center high mounted stop lamp.

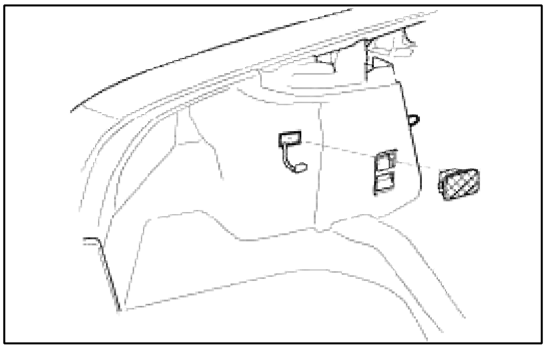


4. Installation is the reverse of removal.

Body Electrical System > Lighting System > Trunk Lamps > Repair procedures

REMOVAL AND INSTALLATION

1. Disconnect the negative battery terminal.
2. Detach the luggage lamp assembly from the luggage side trim with a flat-tip screwdriver.



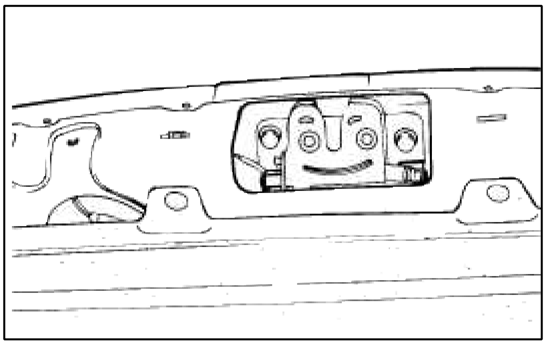
3. Installation is the reverse of removal.

INSPECTION

TRUNK ROOM LAMP SWITCH

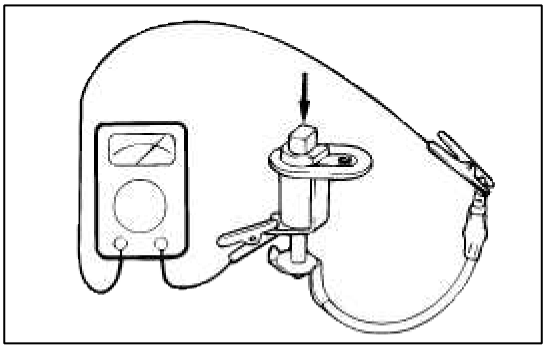
1. Disconnect the negative battery terminal.

2. After opening the trunk, disconnect the connector from the rear harness.



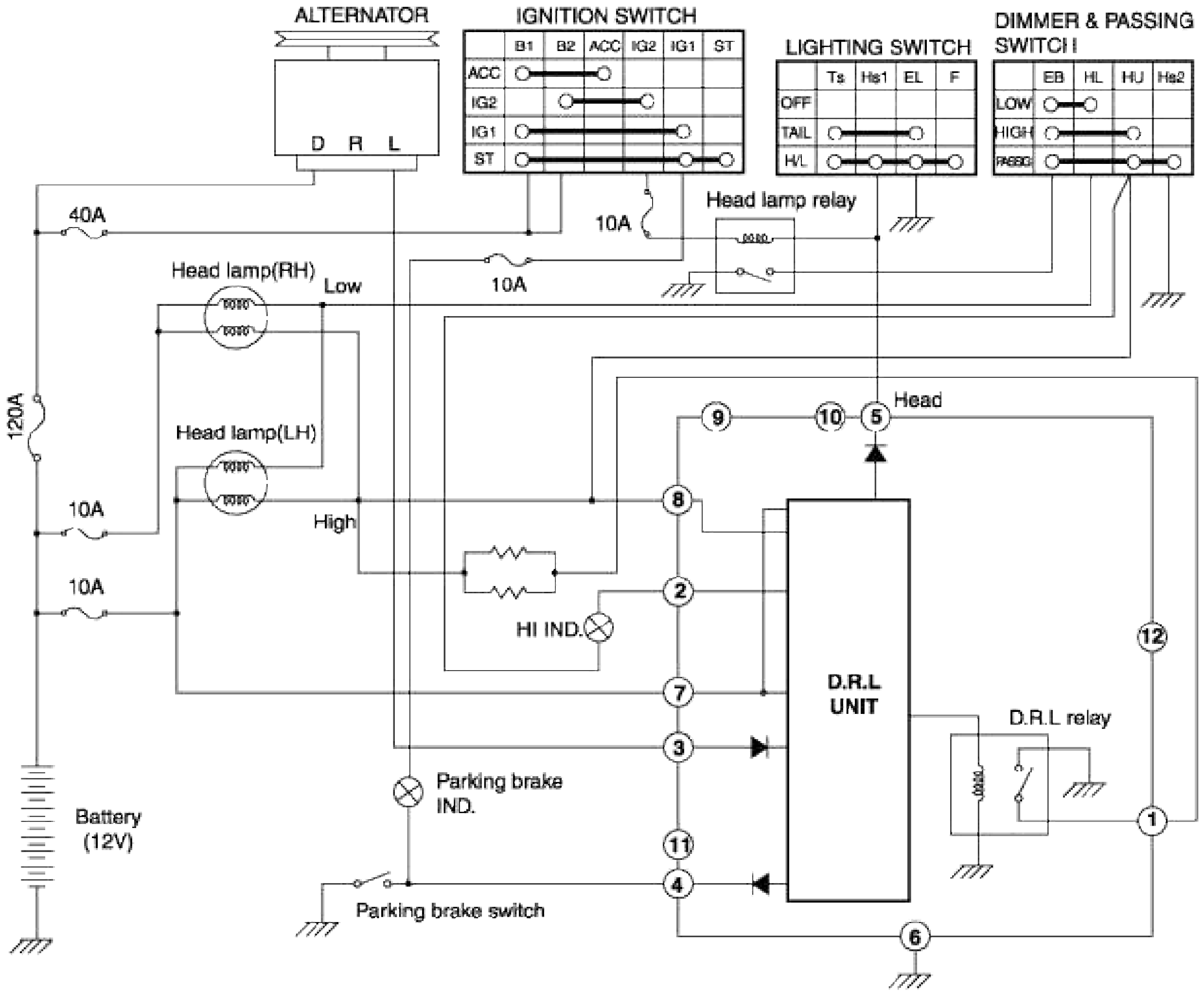
3. Check for continuity between the terminal and body while pushing the rod.

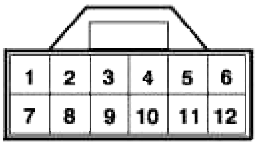
Switch rod condition	Continuity
Pushed (OFF)	Non-conductive (∞Ω)
Released (ON)	Conductive (0Ω)



Body Electrical System > Daytime Running Lights > DRL Control Module > Schematic Diagrams

CIRCUIT DIAGRAM


ALTERNATOR
D R L
IGNITION SWITCH
B1 B2 ACC IG2 IG1 ST
ACC
IG2
IG1
ST
LIGHTING SWITCH
Ts Hs1 EL F
OFF
TAIL
H/L
DIMMER & PASSING SWITCH
EB HL HU Hs2
LOW
HIGH
PASSG
40A
10A
Head lamp relay
10A
Head lamp(RH)
Low
120A
Head lamp(LH)
High
10A
10A
HI IND.
Head
D.R.L UNIT
D.R.L relay
Parking brake IND.
Battery (12V)
Parking brake switch
1
2
3
4
5
6
7
8
9
10
11
12


1 2 3 4 5 6
7 8 9 10 11 12

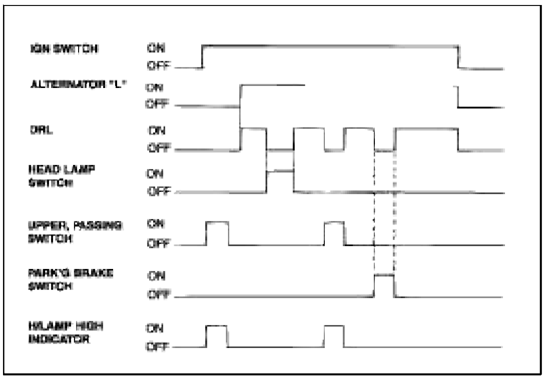
(DRL control module side connector)

Body Electrical System > Daytime Running Lights > DRL Control Module > Repair procedures

INSPECTION

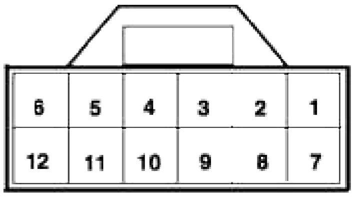
OPERATION CHECK

Check that the lights operate according to the following timing chart.



INSPECT CIRCUITS FOR DAYTIME RUNNING LIGHT SYSTEM

1. Disconnect the wire connector to DRL module from engine compartment.
2. Inspect the connector on wire harness side as shown.



Harness side

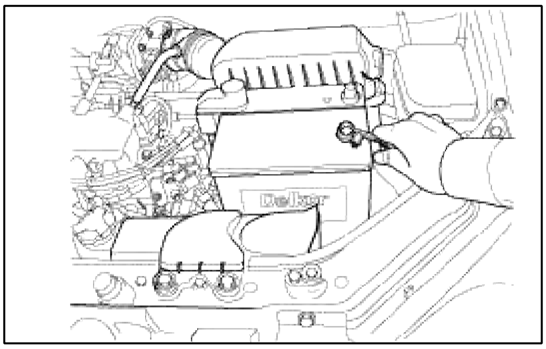
Check for	Test connection	Condition		Test specification
Continuity	4-Ground	Parking brake switch	OFF (Released)	No continuity
			ON (Pull up)	Continuity
	5-Ground	Lighting switch	OFF	No continuity
			ON	Continuity
	6-Ground	Constant		Continuity
Voltage	8-Ground	Dimmer & passing switch	ON	No voltage
			OFF	Battery voltage
	5-Ground	Ignition switch ON	Head light OFF	Battery voltage
			Head light ON	No voltage
	3-Ground	Engine	Stop	No voltage
			Running	Battery voltage
	7-Ground	Head lamp switch	OFF	Battery voltage
			ON	No voltage

If circuit is not as specified, refer to schematic diagram and inspect short or circuits.

Body Electrical System > Ignition System > Ignition Switch > Repair procedures

REMOVAL AND INSTALLATION

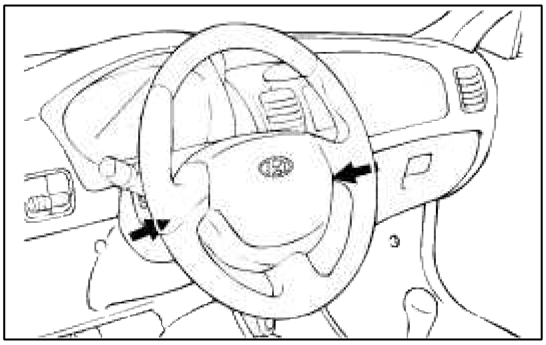
1. Disconnect the negative(-) battery terminal.



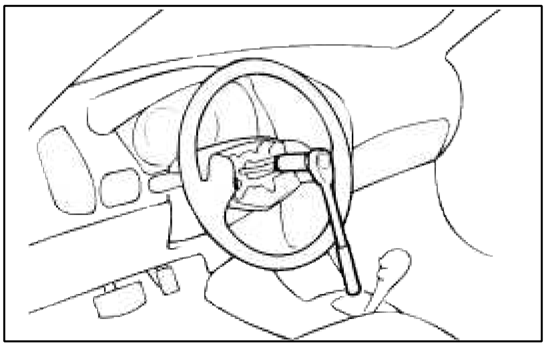
2. Remove the 2 bolts and disconnect the airbag connector and the horn connector, then remove the airbag module.

CAUTION

Remove the horn pad only for vehicle without airbag.



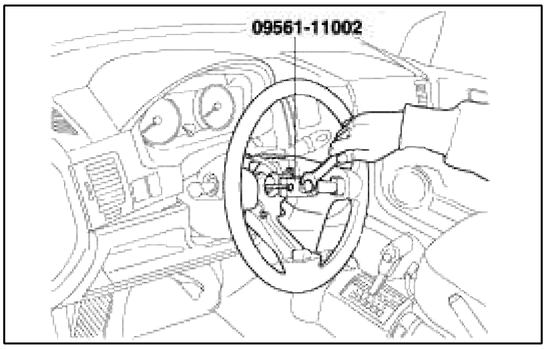
3. Remove the steering wheel lock nut.



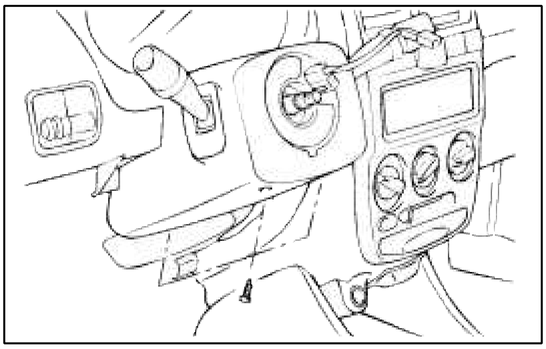
4. Remove the steering wheel with special tool (09561-11002).

CAUTION

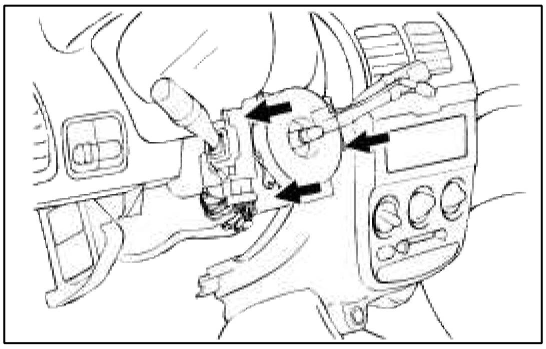
Do not hammer on the steering wheel to remove it. Doing so may damage the collapsible mechanism.



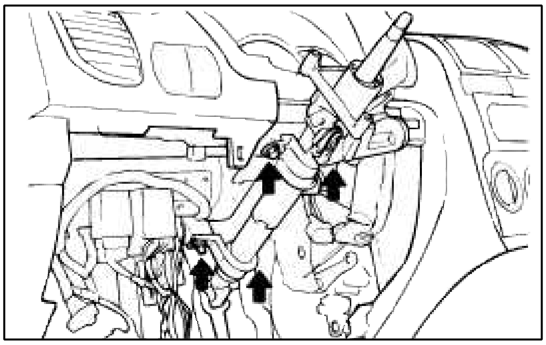
5. Remove the steering column shroud after removing 3 screws.



6. Remove the screws holding the multi-function switch, then disconnect the wire connector. Remove the multi-function switch assembly.



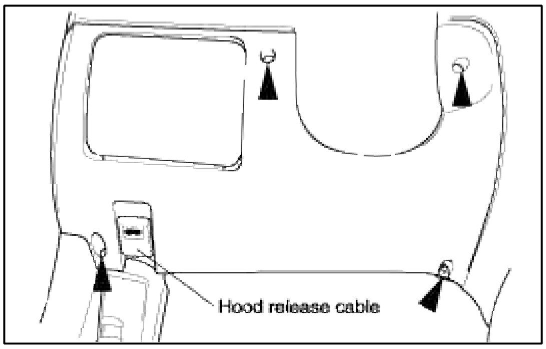
7. Remove the steering column mounting bolts.



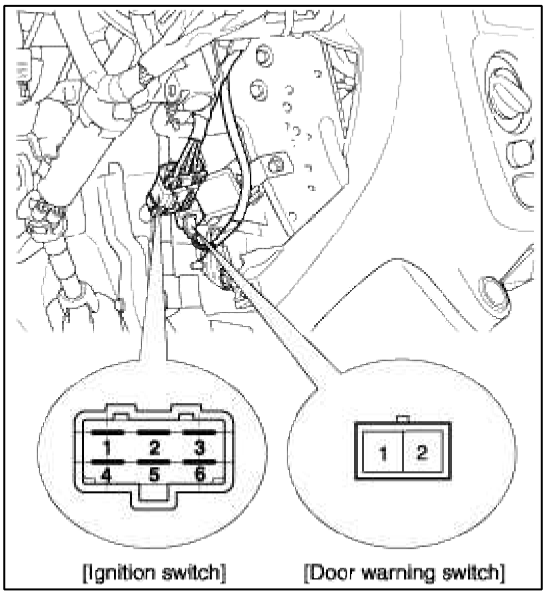
8. Remove the key lock assembly from the steering column shaft. (Refer to ST group)
9. Installation is the reverse of removal.

INSPECTION

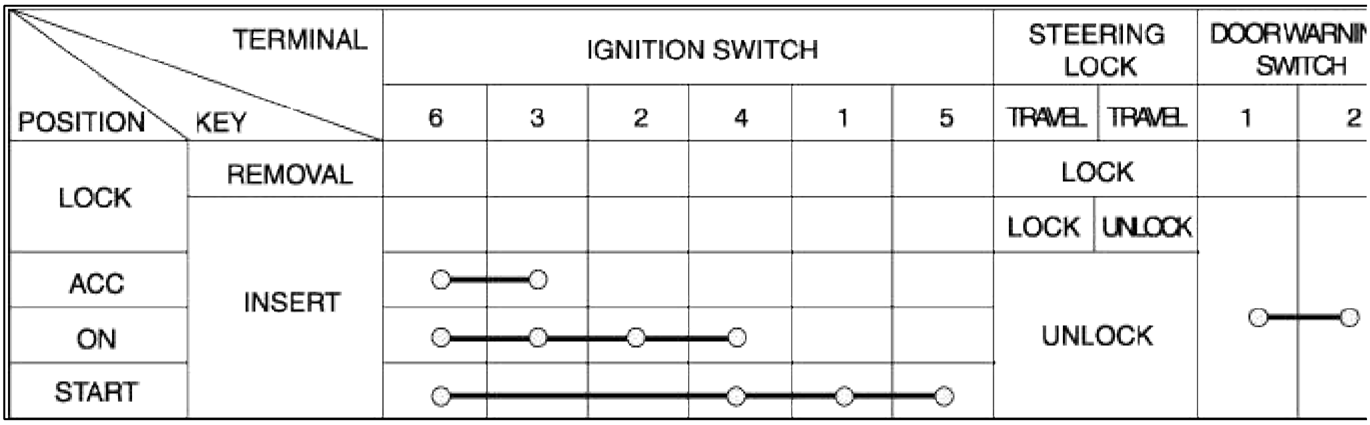
1. Remove the driver's side crash pad lower panel.



2. Disconnect the ignition switch connector and the door warning switch connector under the steering column.


1
2
3
4
5
6
1
2
[Ignition switch]
[Door warning switch]

3. Check for continuity between the terminals.
4. If continuity is not as specified, replace the switch.

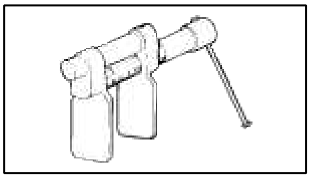


POSITION	TERMINAL / KEY	IGNITION SWITCH 6	3	2	4	1	5	STEERING LOCK TRAVEL	TRAVEL	DOOR WARNIN SWITCH 1	2
LOCK	REMOVAL							LOCK			
	INSERT							LOCK	UNLOCK	○	○
ACC		○	○					UNLOCK			
ON		○	○	○	○						
START		○	—	—	○	○	○				

ACCENT(LC) > 2002 > G 1.5 SOHC > Brake System

Brake System > General Information > Special Service Tools

SPECIAL TOOLS

TOOL(Number and name)	ILLUSTRATION	USE
09581 ~ 11000 Piston expander		Spreading the front disc brake piston.

Brake System > General Information > Troubleshooting

TROUBLESHOOTING

SYMPTOM	PROBABLE CAUSE	REMEDY
Noise or vibration when brakes are applied	Backing plate or caliper improperly mounted Loose backing plate or caliper mounting bolts Unevenly worn or cracked brake drum or brake disc Foreign material in brake drum Seized pad or lining contact surface Excessive caliper to pad assembly clearance Uneven pad contact Lack of lubrication in sliding parts Loose suspension parts	Correct Retighten Replace Clean Replace Correct Correct Lubricate Retighten
Vehicle pulls to one side when brakes are applied	Difference between left and right tire inflation pressure Improper front wheel alignment Inadequate contact of pad or lining Grease or oil on pad or lining surface Drum warpage or uneven wear Incorrect wheel cylinder installation Auto adjuster malfunction	Adjust Adjust Correct Replace Replace Correct Correct
Insufficient braking power	Low or deteriorated brake fluid Air in the brake system Brake booster malfunction Inadequate contact of pad or lining Grease or oil on pad or lining surface Auto adjuster malfunction Overheated brake rotor due to dragging of pad or lining	Refill or change Bleed the system Correct Correct Replace Correct Correct Replace Replace

	Restricted brake line Proportioning valve malfunction	
Increased pedal stroke required (Reduced pedal to floorboard clearance)	Air in the system Brake fluid leakage Auto adjuster malfunction Excessive push rod to master cylinder clearance	Bleed the system Correct Correct Adjust
Brake drag	Incomplete release of parking brake Incorrect parking brake adjustment Worn brake pedal return spring Restricted master cylinder return port Broken rear drum brake shoe return spring Lack of lubrication in sliding parts Defective master cylinder check valve or piston return spring Insufficient push rod to master cylinder clearance	Adjust Adjust Replace Correct Replace Lubricate Replace Replace
Insufficient parking brake function	Worn brake lining or pad Grease or oil on lining or pad surface Parking brake cable sticking Auto adjuster malfunction Excessive parking brake lever stroke	Replace Replace Replace Adjust Adjust the parking brake lever stroke or check the parking brake cable routing

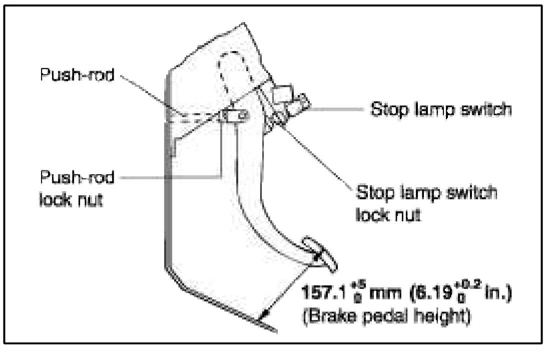
Brake System > General Information > Repair procedures

ADJUSTMENT PROCEDURE

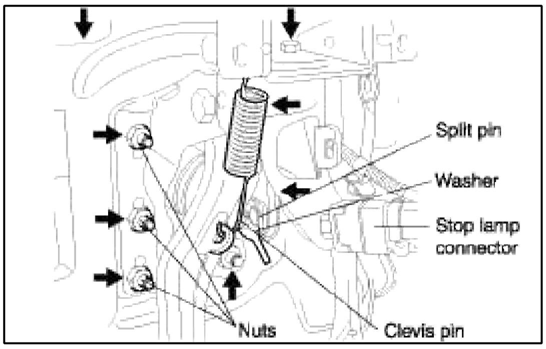
BRAKE PEDAL HEIGHT ADJUSTMENT

1. Remove the carpet and measure the brake pedal height. If the height is over the standard value, adjust it as the following procedures.

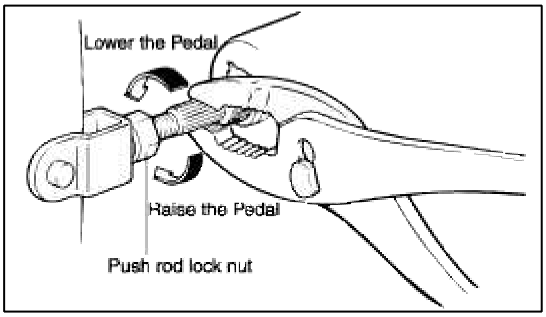
157.1(+5,0) mm [6.19 (+0.2,0) in.]


Push-rod
Push-rod lock nut
Stop lamp switch
Stop lamp switch lock nut
157.1 $^{+5}_{0}$ mm (6.19 $^{+0.2}_{0}$ in.)
(Brake pedal height)

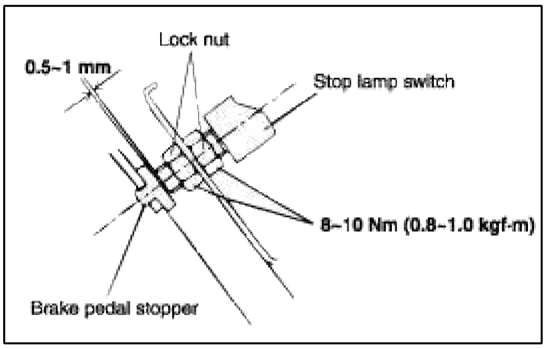
(1) Disconnect the stop lamp switch connector, loosen the stop lamp switch lock nut, and back off the stop switch until it doesn't reach the brake pedal arm.


Split pin
Washer
Stop lamp connector
Nuts
Clevis pin

(2) Loosen the push rod lock nut, and screw the push rod in or out with pliers until the standard pedal height from the floor is reached.


Lower the Pedal
Raise the Pedal
Push rod lock nut

(3) Turn the stop lamp switch until clearance between the stop lamp switch outer case and stopper becomes 0.5~1.0mm.
Tighten the lock nut firmly.


Lock nut
0.5~1 mm
Stop lamp switch
8~10 Nm (0.8~1.0 kgf-m)
Brake pedal stopper

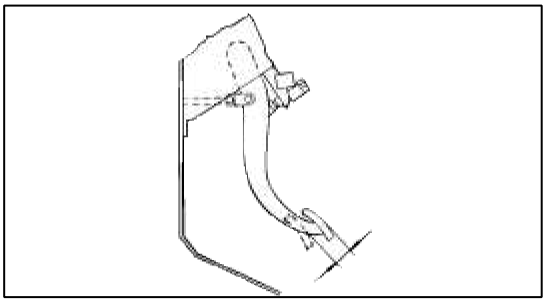
> **NOTE**
>
> Brake pedal stroke should be 125.6mm (4.95 in.) or more. If the brake pedal stroke is not 125.6mm or more, readust the brake pedal height and stop lamp switch clearance.

(4) Connect the stop lamp switch connector.

(5) Make sure that the stop lamps go off when the brake pedal is released.

(6) With the engine off, depress the pedal 2~3 time to get rid of pressure, and then inspect the play on the pedal by pushing it by hand.

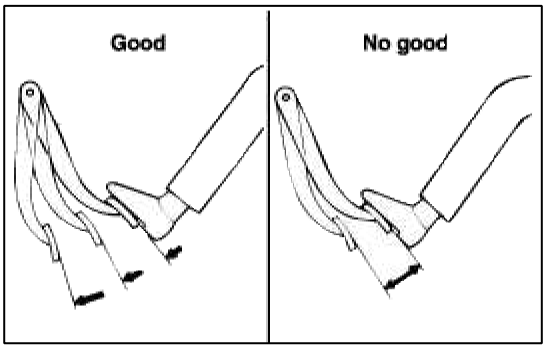
3 ~ 8 mm (0.11 ~0.31 in.)

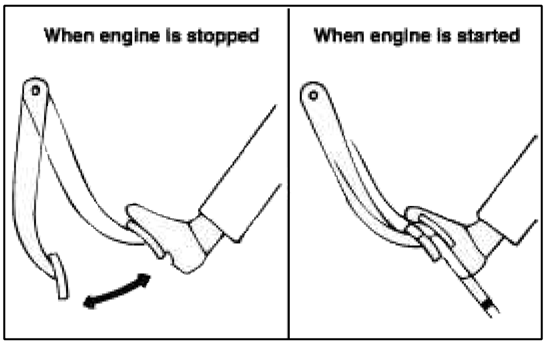


BRAKE BOOSTER OPERATION TEST WITHOUT A TESTER

1. Run the engine for one or two minutes, and then shut it off. Depress the brake pedal several times at normal foot pressure. If the pedal goes down further at first but rises gradually after the second or third time, the brake booster is functioning properly. If the pedal height doesn’t change, the booster is damaged.
2. With the engine off, depress the brake pedal several times and check on the pedal height change. After that, with the pedal depressed, start the engine. If the pedal goes down slightly, the booster is on good condition. If the pedal height doesn’t change, the booster is damaged.
3. With the engine running, depress the brake pedal and then stop the engine. Hold the pedal depressed for 30 seconds. If the pedal height does not change, the booster is in good condition. If the pedal goes up, the booster is damaged.

   f one of the above three tests is not okey, check the vacuum hoses and the brake booster and make any necessary corrections. If all tests are OK, the booster is good.



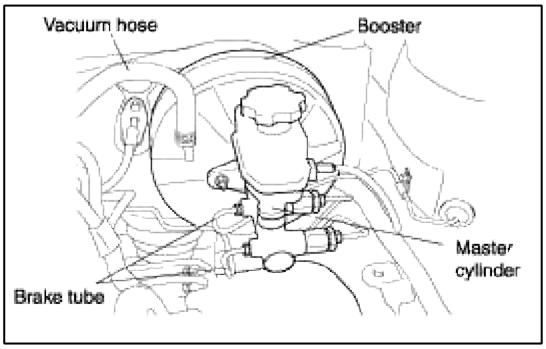


CHECK BALBE OPERATION CHECK

1. Remove the vacuum hose.

NOTE

The check valve is press-fitted inside the vacuum hose at the position of the marking.

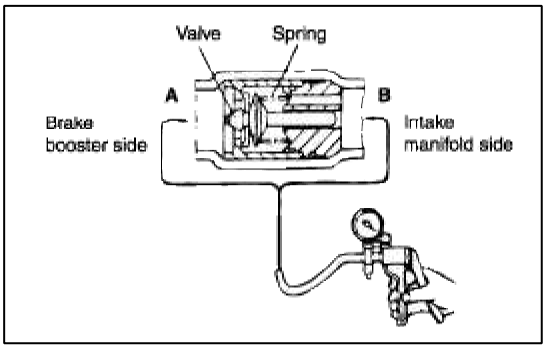

Vacuum hose
Booster
Master cylinder
Brake tube

2. Check the operation of the check valve by using a vacuum pump.

Vacuum pump connection	Accept/Reject criteria
Connection at the brake booster side (A)	A negative pressure(vacuum) is created and held
Connection at the intake manifold side (B)	A negative pressure(vacuum) is not created

CAUTION

If the check valve is defective, replace it if an assembly unit together with vacuum hose.


Valve
Spring
A
B
Brake booster side
Intake manifold side

BLEEDING THE BRAKE SYSTEM

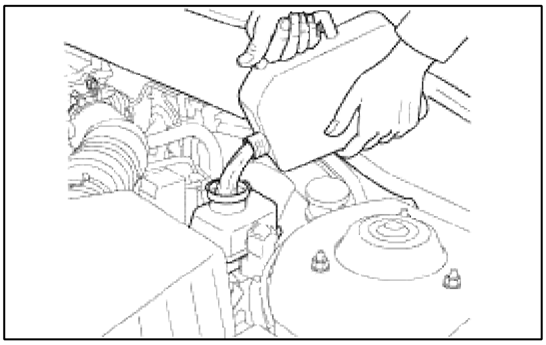
1. Remove the reservoir cap and fill the brake reservoir with brake fluid.

CAUTION

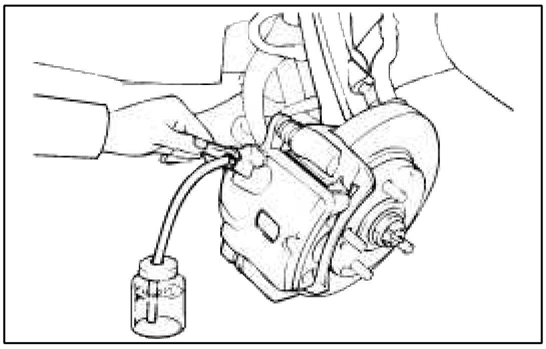
If there is any brake fluid on any painted surface, wash it off immediately.

NOTE

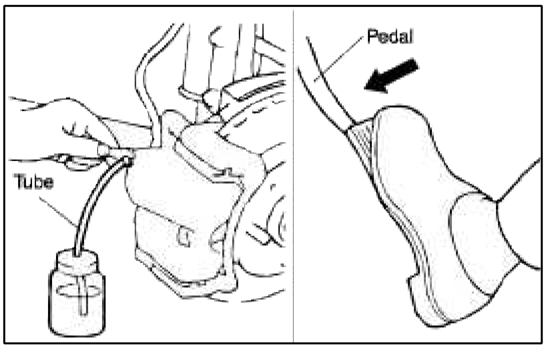
When bleeding pressurized fluid, do not depress the brake pedal.



2. Connect a vinyl tube to the wheel cylinder bleeder plug, and insert the other end of tube in the container of brake fluid.



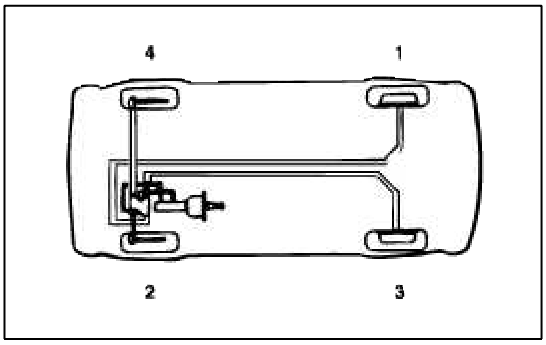
3. Depress the brake pedal several times.
4. While depressing the brake pedal fully, loosen the bleeder plug until the fluid starts to run out. Then close the bleeder plug.



5. Repeat the steps 3 and 4 until there are no more bubbles in the fluid.
6. Tighten the bleeder plug screw.

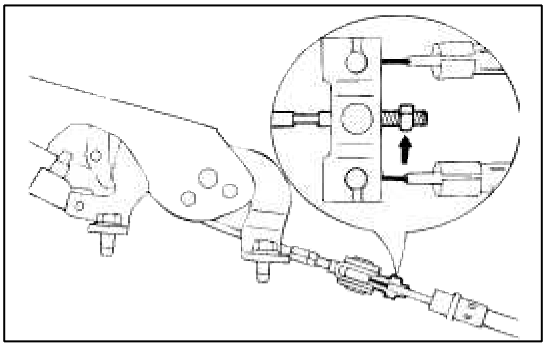
Bleeder screw tightening torque:
7~9 Nm (70~90 kgf·cm,5.2~6.6 lb·ft)

7. Repeat the above procedure for each wheel in the sequence shown in the illustration.



ADJUSTMENT OF PARKING BRAKE STROKE

1. After bleeding, depress the brake pedal 20 times with a force of over 10 kgf.
2. Pull the brake lever to full stroke more than 3 times
3. When pulling the lever (pulling point : at 25mm (0.98 in.) from the lever assembly end as shown in the illustration), it should be locked at 6~7 clicks.
   Adjust the parking brake if the lever clicks are out of standard value.



4. The indicator light will go out when the brake lever is fully released, and will light up with the lever pulled one notch. If it does not operate properly, replace it.
5. After adjustment, check that the rear brakes do not drag with the parking brake lever released.

Brake System > General Information > Specifications

SPECIFICATIONS

ITEMS	SPECIFICATIONS
Master cylinder	
Type	Tandem type
I.D. mm (in.)	22.222 (0.875)
Fluid level warning sensor	Provided
Brake booster	
Type	Vacuum type with tandem booster
Effective dia. mm (in.)	228.6 (9)
Boosting ratio	5.1 : 1
Proportioning valve	
Cut-in pressure (Split point)	2.94 MPa (30 kg/cm², 427 psi)
Decompression ratio	0.27 : 1
Front brake	
Type	Floating type with ventilated disc
Disc O.D. mm (in.)	241 (9.49)
Disc thickness mm (in.)	19 (0.75)
Pad thickness mm (in.)	9 (0.35)
Cylinder I.D. mm (in.)	54 (2.13)

Rear brake (Drum)	
Type	Leading trailing drum
Drum I.D. mm (in.)	180 (7.09)
Wheel cylinder I.D. mm (in.)	17.78 (0.7)
Clearance adjustment	Automatic
Parking brake	
Actuation	Mechanical brake acting on rear wheels
Type	Lever
Cable arrangement	V type
Anti-lock Brake System (ABS)	
HECU (HU+ECU)	
ECU type	Motor, valve relay integrated type
Motor power	Max.150W
Accumulator volume	3.0cc
Inlet valve (Front/Rear) mm (in.)	0.5 (0.019)/0.315 (0.012)
Outlet valve (Front/Rear) mm (in.)	0.56 (0.022)/0.355 (0.014)
Wheel speed sensor	
Output frequency	20 ~ 2,000Hz
Output voltage	Min.130mVp.p
Internal resistance	1,385 ± 110Ω
Tone wheel teeth	44 teeth
Air gap mm (in.)	0.2 ~ 1.1 (0.008 ~ 0.043)
ABS & EBD warning lamp	
Type	Active warning lamp module
Operating voltage	12V
Current	80mA

SERVICE STANDARD

ITEM	STANDARD VALUE	SERVICE LIMIT
Brake pedal height	157.1 (+5,0) mm [6.19 (+0.2, 0) in.]	
Brake pedal stroke	125.6 mm (4.95 in.) or more	
Stop lamp switch outer case to pedal stopper clearance	0.5 ~ 1.0 mm (0.02 ~ 0.04 in.)	
Brake pedal free play	3~8 mm(0.11~0.31in.)	
Booster push rod to master cylinder piston clearance	0 (at 500mmHg vacuum)	
Parking brake lever stroke when lever assembly is pulled with 196N(20kg, 44lb force)	6~7 clicks	
Front disc brake pad thickness	9 mm (0.354 in.)	2 mm (0.0787in.)
Front disc thickness(minimum)	19 mm (0.75 in.)	17 mm (0.67 in)
Front disc abrasion	-	0.05 mm (0.002 in.)

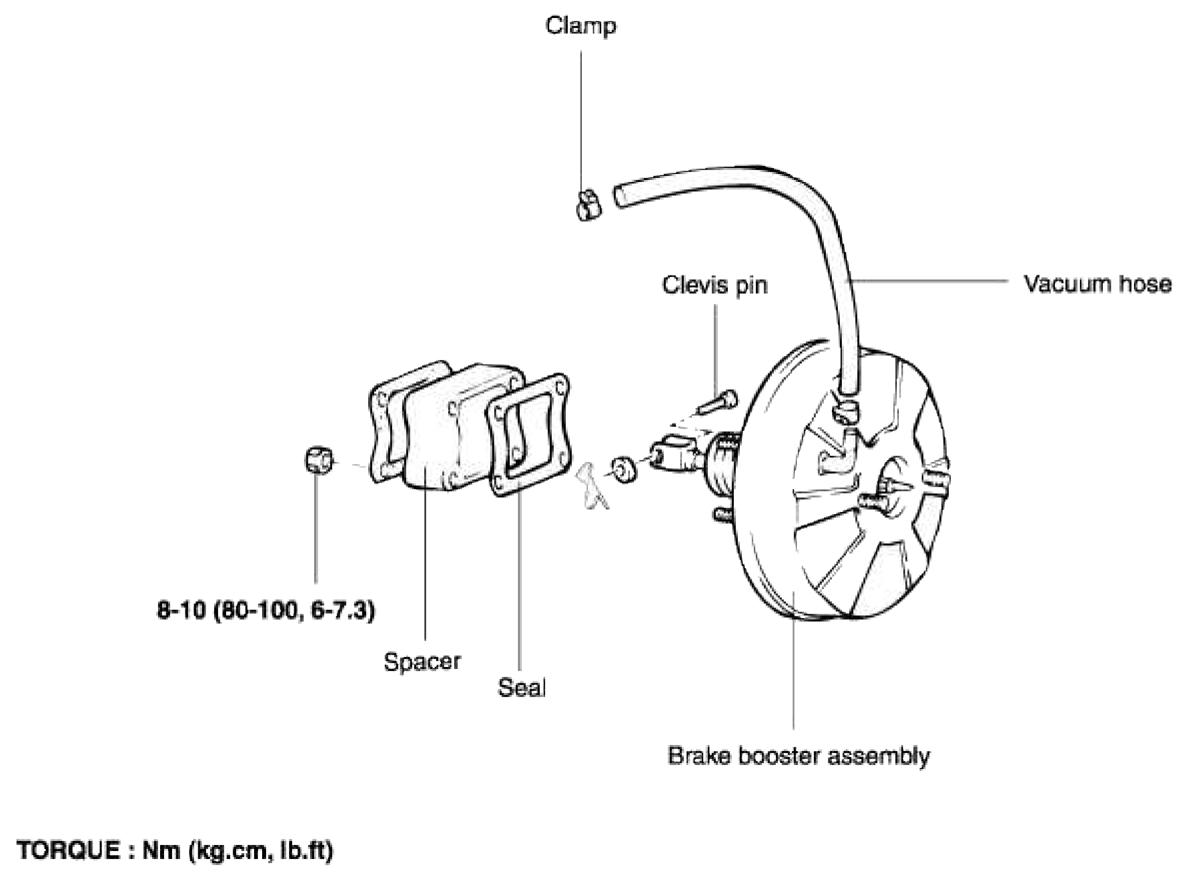
Drum brake lining thickness	4.8mm (0.19 in.)	1 mm (0.04 in.)
Brake drum I.D.(maximum)	180mm (7.09in.)	182 mm(7.17 in.)
Wheel cylinder to piston clearance	-	0.15 mm (0.006 in.)

TIGHTENING TORQUE

	Nm	**kgf·cm**	**lb·ft**
Master cylinder to booster mounting nut Brake booster mounting nut Brake booster vacuum hose fitting to surge tank Bleeder screw Brake tube flare nut, brake hose Proportioning valve mounting Caliper guide rod bolt Caliper pin bolt Caliper assembly to knuckle Brake hose to front caliper Brake tube mounting nut HECU mounting bolt Wheel sensor mounting bolt	8 ~ 12 8 ~ 10 8 ~ 12 7 ~ 13 13 ~ 17 35 ~ 55 22 ~ 32 35 ~ 45 65 ~ 75 25 ~ 30 13 ~ 17 8 ~ 10 8 ~ 10	80 ~ 120 80 ~ 100 80 ~ 120 70 ~ 130 130 ~ 170 350 ~ 550 220 ~ 320 350 ~ 450 650 ~ 750 250 ~ 300 130 ~ 170 80 ~ 100 80 ~ 100	6 ~ 9 6 ~ 7.3 6 ~ 9 5 ~ 9.5 10 ~ 12 26 ~ 41 16 ~ 24 26 ~ 33 48 ~ 55 18 ~ 22 10 ~ 12 6 ~ 7.3 6 ~ 7.3

Brake System > Brake System > Brake Booster > Components and Components Location

COMPONENTS


Clamp
Clevis pin
Vacuum hose
8-10 (80-100, 6-7.3)
Spacer
Seal
Brake booster assembly
TORQUE : Nm (kg.cm, lb.ft)

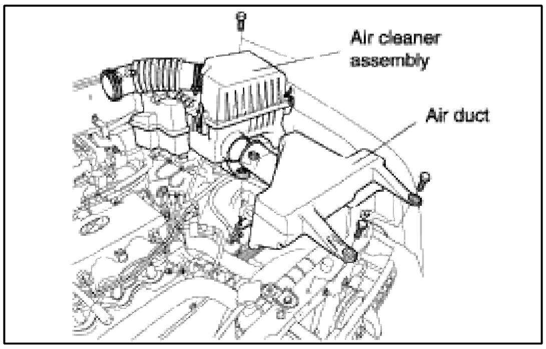
Brake System > Brake System > Brake Booster > Repair procedures

REMOVAL

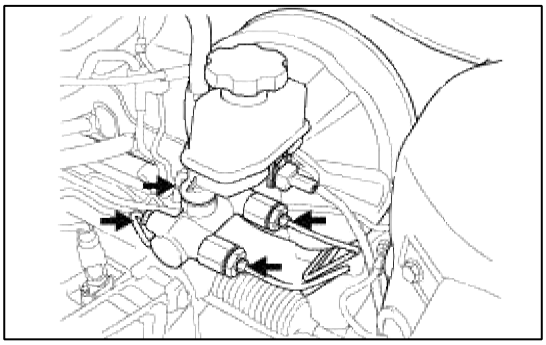
CAUTION

- Be careful not to bend or damage the brake lines when removing the master cylinder.
- Do not spill brake fluid on the vehicle; it may damage the paint; if brake fluid does contact the paint, wash it off immediately with water.
- To prevent spills, cover the hose joints with rags or shop towels.

1. Remove the air cleaner and the air duct.


Air cleaner assembly
Air duct

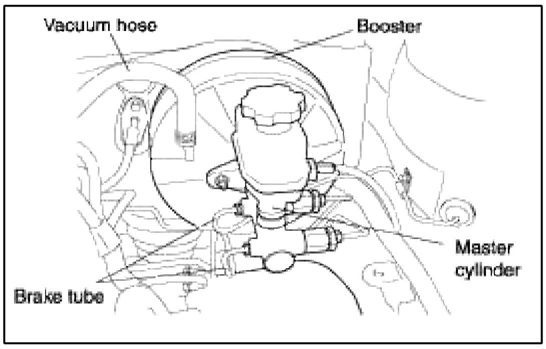
2. Remove the brake fluid level switch connector.



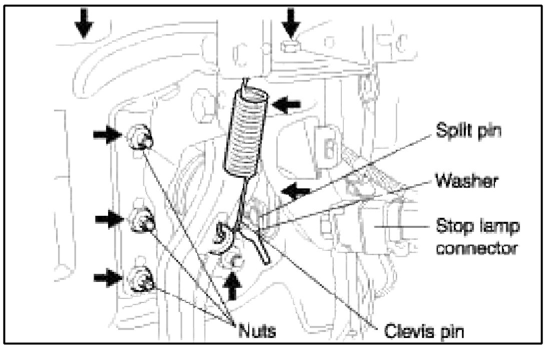
3. After removing the brake reservoir cap, suck out the brake fluid in the reservoir using a syringe or equivalent.
4. Disconnect the brake tube from the master cylinder.

> **CAUTION**
>
> Take care not to contaminate the brake fluid.

5. Remove the master cylinder from the brake booster.
6. Remove the vacuum hose from the booster.


Vacuum hose
Booster
Master cylinder
Brake tube

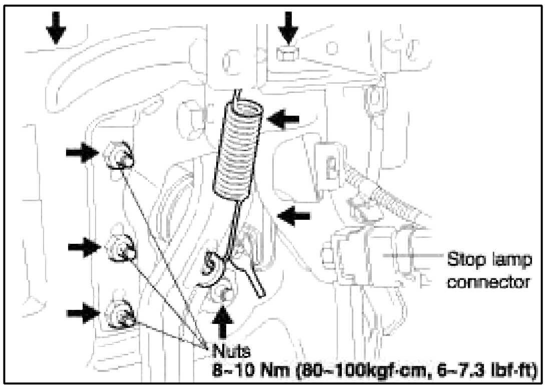
7. Remove the push rod from the brake pedal.
8. Remove the booster mounting nuts.


Split pin
Washer
Stop lamp connector
Nuts
Clevis pin

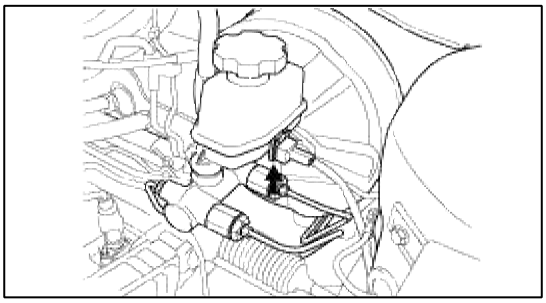
INSTALLATION

1. Install the brake booster and tighten the mounting nut.

Tightening torque Nm (kgf·cm, lb·ft) Brake booster mounting nut: 8~10 (80~100, 6~7.3)


Stop lamp connector
Nuts
8~10 Nm (80~100kgf·cm, 6~7.3 lbf·ft)

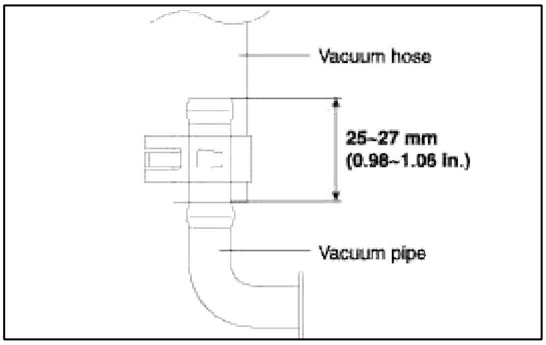
2. Apply grease to the contact points of the brake pedal and the push rod.
3. Connect the brake pedal and the clevis with a clevis pin and install the split pin to the clevis pin.
4. After installing the master cylinder, install the brake tube to the master cylinder.



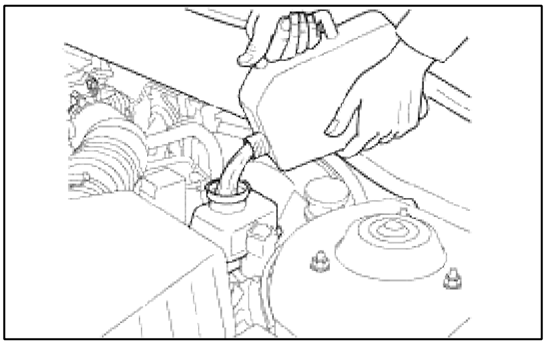
5. Connect the vacuum hose to the brake booster.

CAUTION

- Make sure that there are no bend, twist, or leaks in the vacuum hose.
- When installing the vacuum hose to the vacuum pipe, the vacuum pipe should be inserted to the depth of 25~27mm (0.98~1.06 in.) as shown in the illustration.

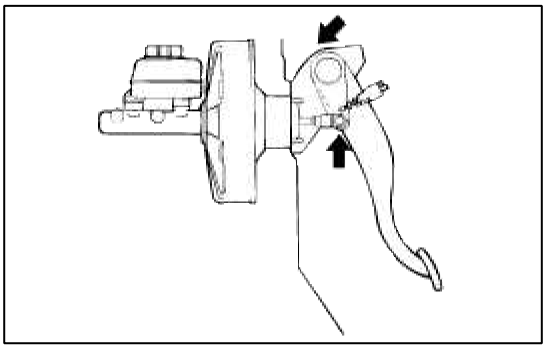

Vacuum hose
25~27 mm
(0.98~1.06 in.)
Vacuum pipe

6. Fill the brake reservoir with brake fluid, and bleed the system. (Refer to "Air bleeding" in adjustment procedure)



7. Check for brake fluid leaks.

8. Inspect and adjust the brake pedal. (Refer to "Brake pedal height adjustment" in adjustment procedure)
9. After installation, apply grease to the contact points of the clevis and brake pedal sufficiently.



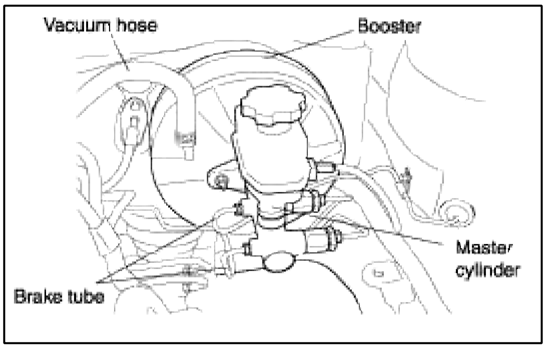
INSPECTION

CHECK VALVE OPERATION CHECK

1. Remove the vacuum hose.

NOTE

The check valve is press-fitted inside the vacuum hose at the position of the marking.

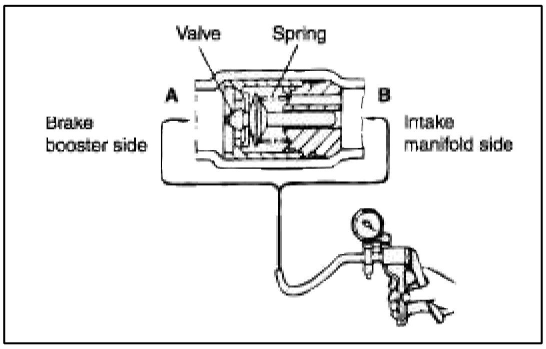

Vacuum hose
Booster
Master cylinder
Brake tube

2. Check the operation of the check valve by using a vacuum pump.

Vacuum pump connection	Accept/Reject criteria
Connection at the brake booster side (A)	A negative pressure (vacuum) is created and held
Connection at the intake manifold side (B)	A negative pressure (vacuum) is not created

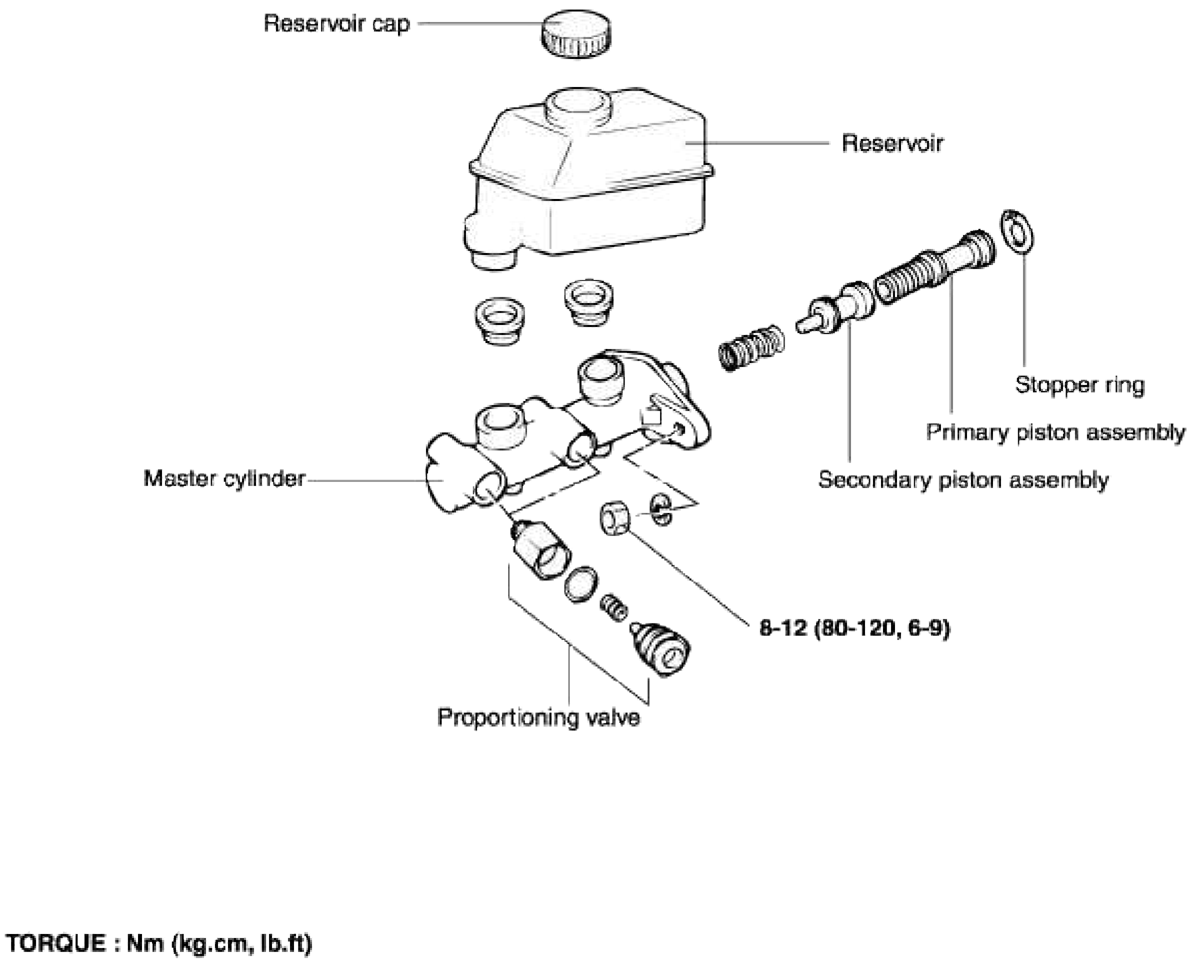
CAUTION

If the check valve is defective, replace it if an assembly unit together with the vacuum hose.


Valve
Spring
A
B
Brake booster side
Intake manifold side

Brake System > Brake System > Master Cylinder > Components and Components Location

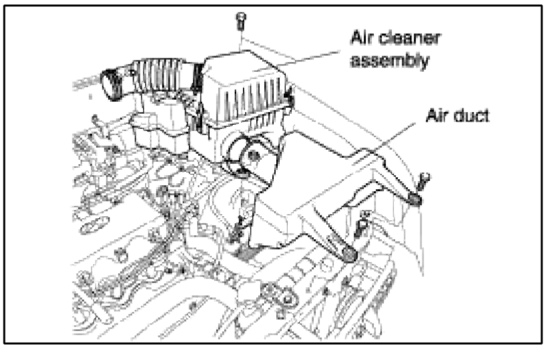
COMPONENTS


Reservoir cap
Reservoir
Stopper ring
Primary piston assembly
Secondary piston assembly
Master cylinder
8-12 (80-120, 6-9)
Proportioning valve
TORQUE : Nm (kg.cm, lb.ft)

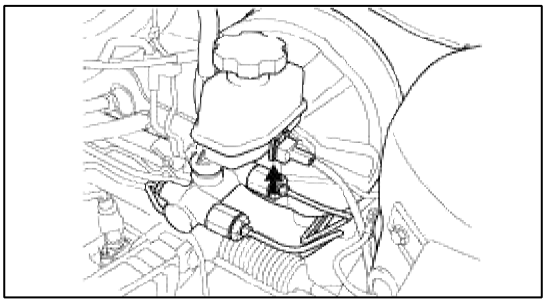
Brake System > Brake System > Master Cylinder > Repair procedures

REMOVAL

1. Remove the air cleaner and the air duct.


Air cleaner assembly
Air duct

2. Remove the brake fluid level switch connector.

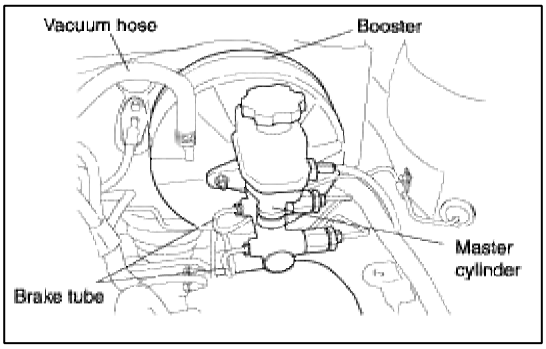


3. Disconnect the brake tube from the master cylinder and install the plug.

CAUTION

- Be careful not to bend or damage the brake lines when removing the master cylinder.
- Do not spill brake fluid on the vehicle; it may damage the paint.
  If brake fluid does contact the paint, wash it off immediately with water.
- To prevent spills, cover the hose joints with rags or shop towels.

4. Remove master cylinder mounting nuts and then lift out the master cylinder.

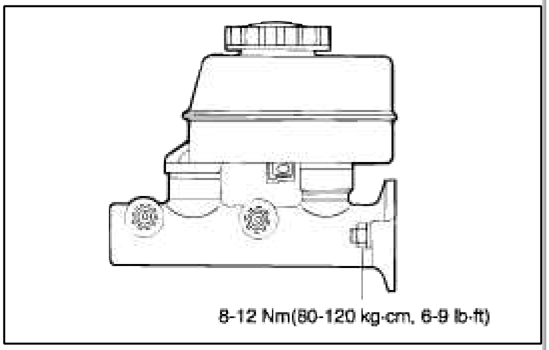


INSTALLATION

1. Install the master cylinder to the brake booster.
2. Connect the brake tubes to the master cylinder.

CAUTION

Check the brake tubes for bends and twists.

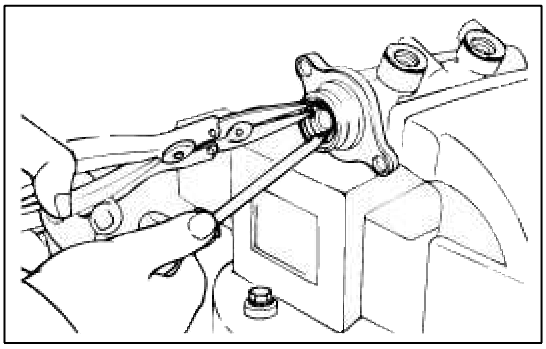


3. After filling the brake reservoir with brake fluid, bleed the system. (Refer to "Air bleeding in adjustment procedure)

DISASSEMBLY

1. Remove the reservoir cap and drain the brake fluid into a suitable container.
2. After disconnecting the mounting screws, pry the reservoir free from the master cylinder.

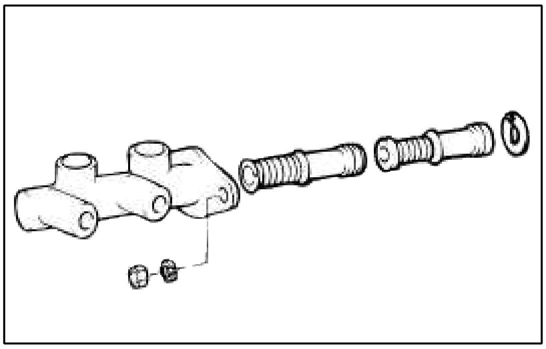
3. Using snap ring pliers, remove the retainer ring.



4. Remove the primary piston and the secondary piston from the master cylinder body.

NOTE

Do not disassemble the primary and secondary piston assembly.



INSPECTION

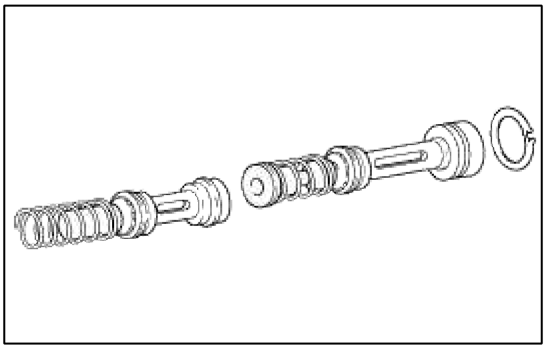
1. Check the master cylinder bore for rust or scoring.
2. Check the master cylinder for wear or damage. If necessary, clean or replace the cylinder.

NOTE

1. If the cylinder bore is damaged, replace the master cylinder assembly.
2. Wash the contaminated parts in alchohol.

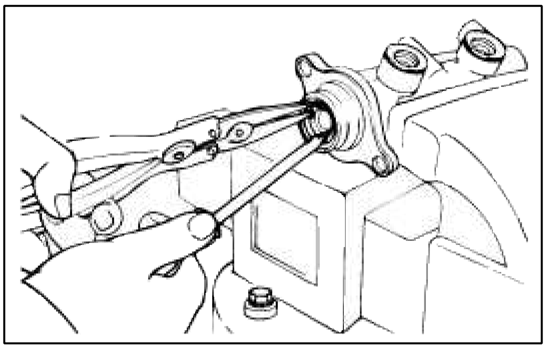
REASSEMBLY

1. Apply genuine brake fluid to the rubber parts of the cylinder kit and grommets.

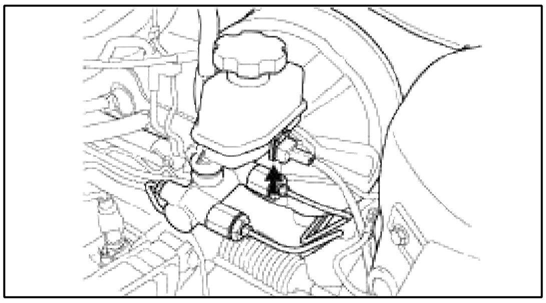


2. Carefully insert the springs and pistons in the proper direction.

3. Press against the pistons with a screwdriver and install the retainer ring.



4. Mount two grommets.
5. Install the reservoir on the cylinder.



Brake System > Brake System > Proportioning Valve > Description and Operation

DESCRIPTION

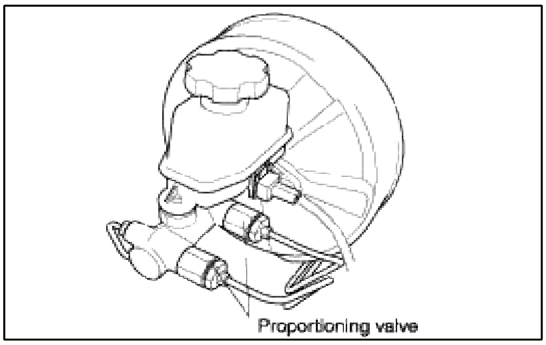
Brake System > Brake System > Proportioning Valve > Repair procedures

REMOVAL AND INSPECTION

1. Remove the proportioning valve from the master cylinder.
2. Connect two pressure gauges; one to the input side, and one to the output side.

> **NOTE**
>
> Be sure to bleed the system after connecting the pressure gauges.

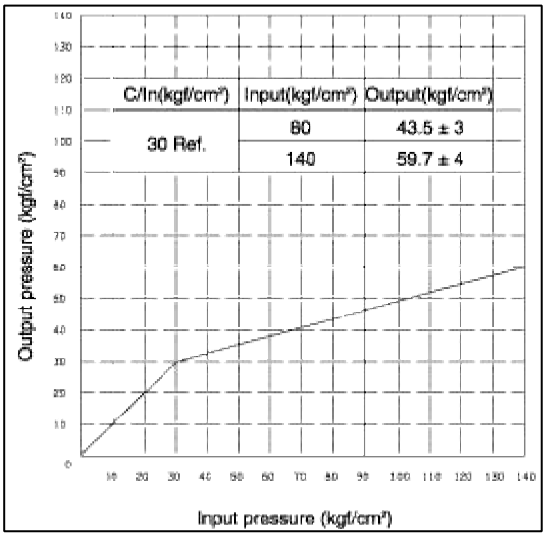
3. With the brakes applied, measure the input pressure and the output pressure. If the measured pressures are within the specified range, the proportioning valve is good.



4. Reconnect the brake lines in their original positions and bleed the system.

NOTE

This figure shows characteristics of the proportioning valve as the pressure increases.

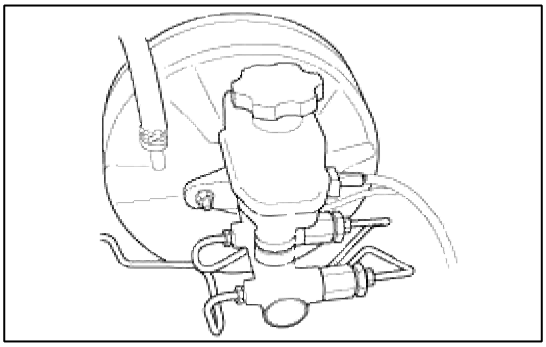


C/In(kgf/cm^2)	Input(kgf/cm^2)	Output(kgf/cm^2)
30 Ref.	80	43.5 ± 3
	140	59.7 ± 4

INSTALLATION

1. Install the propotioning valve to the master cylinder.
2. Tighten the flare nuts and bleed the system.

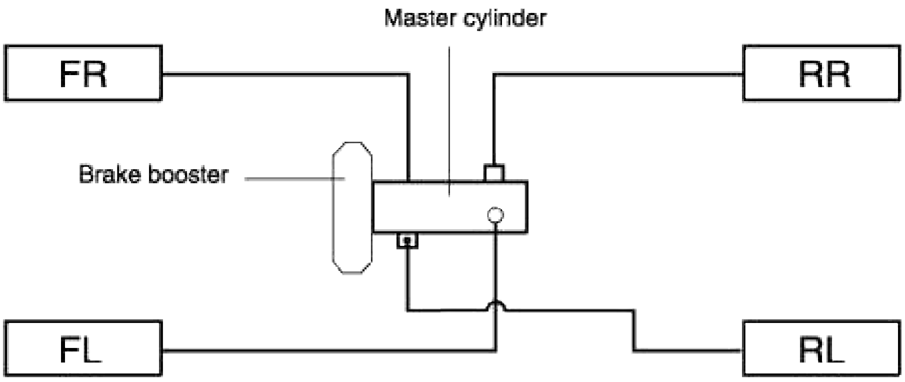
Tighteninq torque
Brake tube flare nut:
13~17 Nm (130~170 kgf·cm, 10~12 lb·ft)
Proportioning valve mounting nut:
35~55 Nm (350~550 kgf·cm, 26~41 lb·ft)



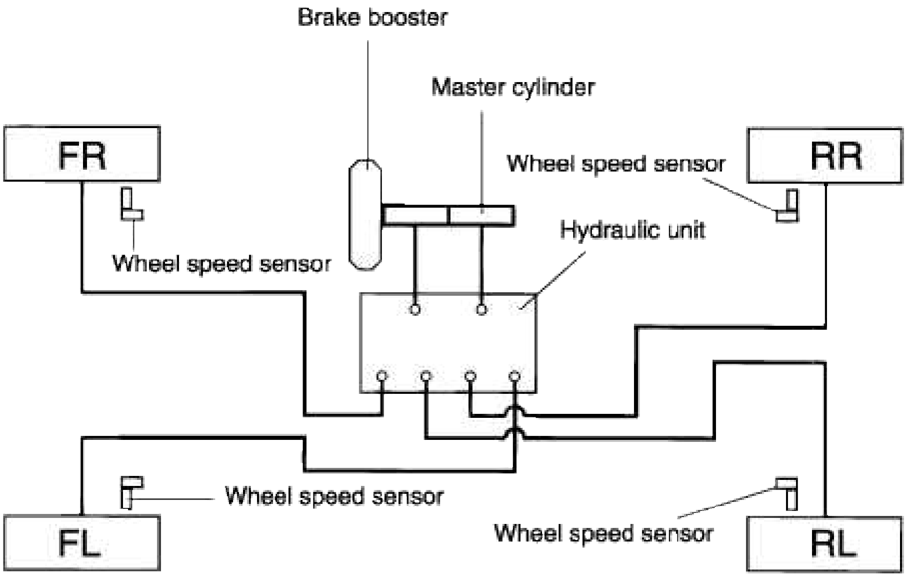
Brake System > Brake System > Brake Line > Components and Components Location

COMPONENTS

[NON ABS SYSTEM]


Master cylinder
FR
RR
Brake booster
FL
RL

[ABS SYSTEM]


Brake booster
Master cylinder
FR
Wheel speed sensor
RR
Hydraulic unit
Wheel speed sensor
Wheel speed sensor
Wheel speed sensor
FL
RL

Brake System > Brake System > Brake Line > Repair procedures

REMOVAL

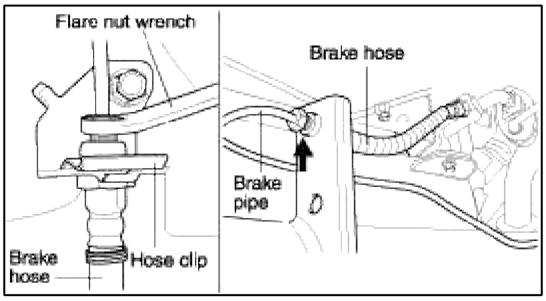
CAUTION

Do not spill brake fluid on the vehicle; it may damage the paint.
If brake fluid does contact the paint, wash if off immediately with water.

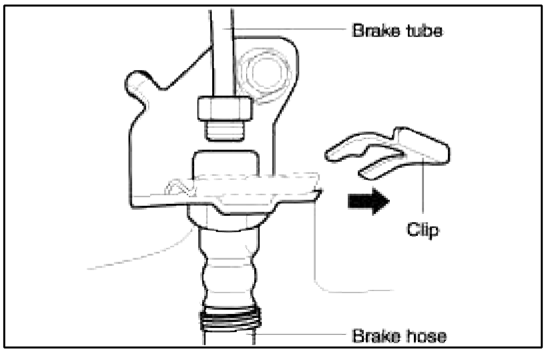
NOTE

Before reassembling, check that all parts are free of dust and other foreign particles.

1. Replace the brake hose if the hose is twisted, cracked, or if it leaks.
2. Disconnect the brake hose from the brake pipe using a flare nut wrench.


Flare nut wrench
Brake hose
Hose clip
Brake hose
Brake pipe

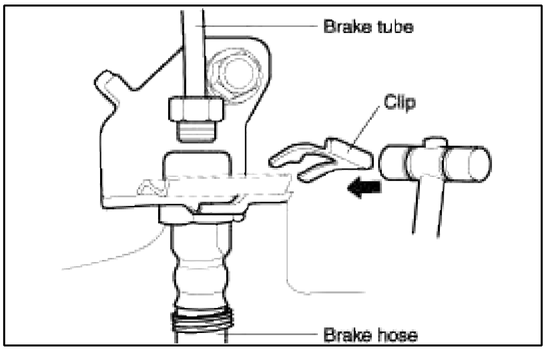
3. Remove the brake hose clip from the brake hose using pliers or a hammer.


Brake tube
Clip
Brake hose

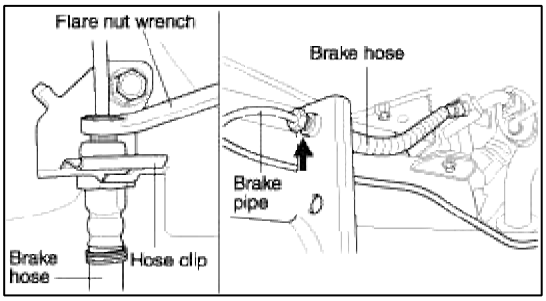
4. Remove the brake hose.

INSTALLATION

1. Install the brake hoses so they do not twist.
2. The brake tubes should be installed away from edges, weld beads or moving parts.
   (1) Align the brake hose connector to the bracket groove.
   (2) Install the brake hose clip.


Brake tube
Clip
Brake hose

   (3) Tighten the brake hose connecting flare nut.


Flare nut wrench
Brake hose
Hose clip
Brake hose
Brake pipe

3. Tighten the connections to the specified torque.

13-17 Nm (130-170 kgf·cm, 10-12 lb·ft) **Brake hose to front caliper:** 25-30 Nm (250-300 kgf·cm, 18-22 lb·ft)

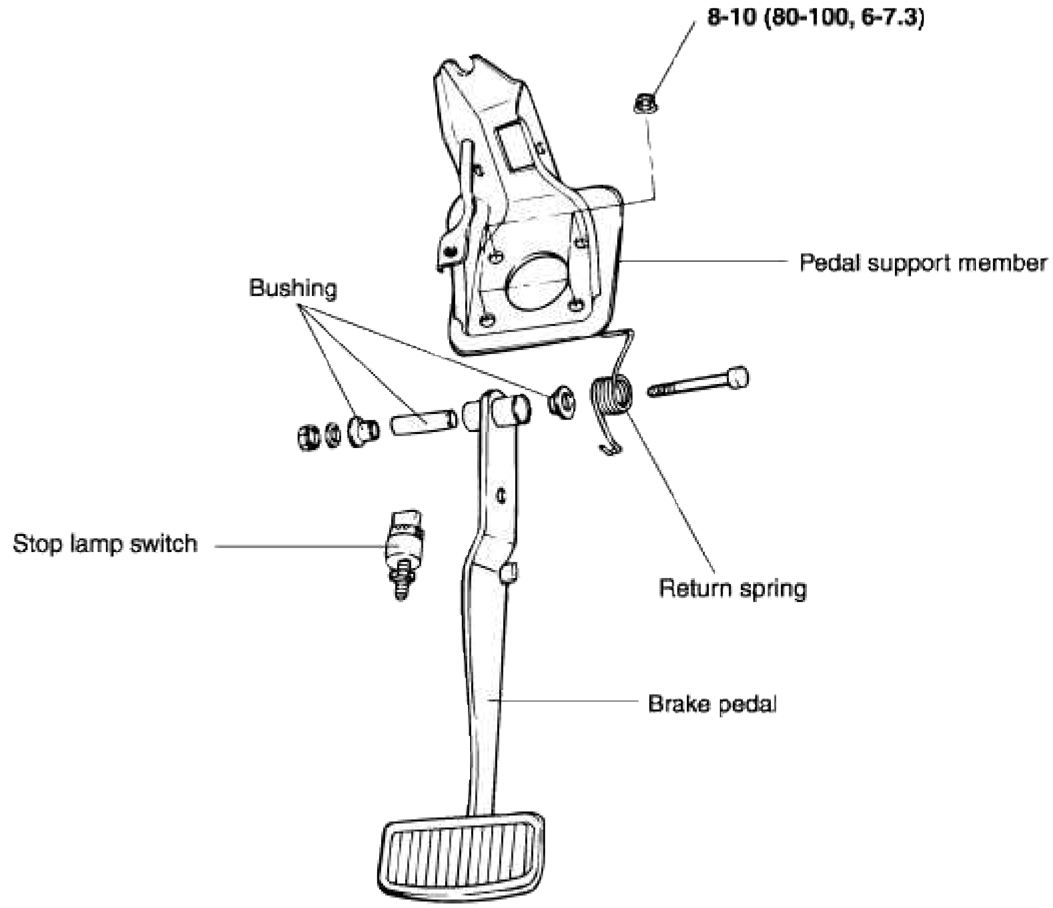
4. After replacing the brake hose, bleed the system. (Refer to "Air bleeding" of adjustment procedure)

INSPECTION

1. Check the brake tubes for cracks, crimps and corrosion.
2. Check the brake hoses for cracks, damage and leakage.
3. Check the brake tube flare nuts for damage and leakage.

Brake System > Brake System > Brake Pedal > Components and Components Location

COMPONENTS

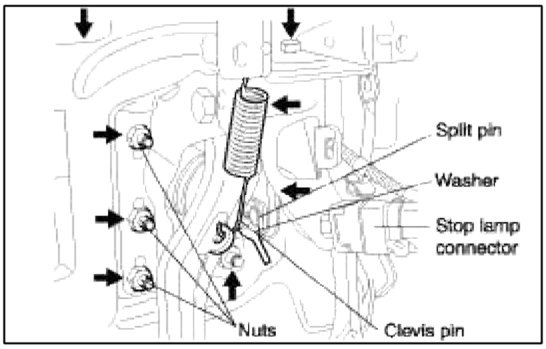

8-10 (80-100, 6-7.3)
Pedal support member
Bushing
Stop lamp switch
Return spring
Brake pedal

TORQUE : Nm (kgf·cm, lb·ft)

Brake System > Brake System > Brake Pedal > Repair procedures

REMOVAL

1. Remove the stop lamp switch.

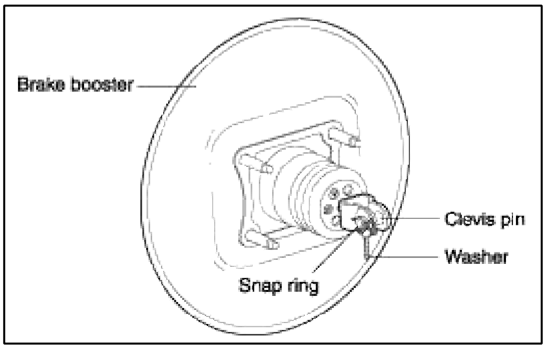

Split pin
Washer
Stop lamp connector
Nuts
Clevis pin

2. Remove the split pin and clevis pin.
3. Remove the brake pedal assembly mounting nut.
4. Remove the brake pedal assembly.

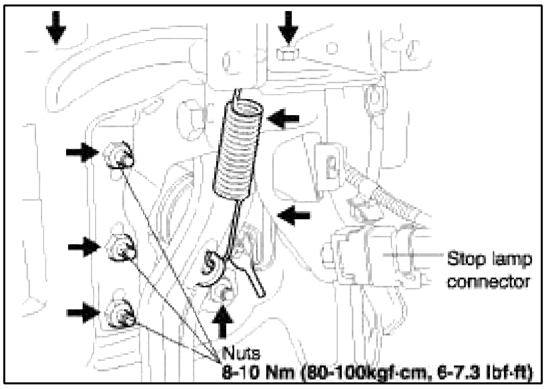
INSTALLATION

1. Installation is the reverse of removal.

> **NOTE**
>
> Be sure to install the split pin on the operating rod clevis pin. Apply the grease (NLGI No.2)


Brake booster
Clevis pin
Washer
Snap ring

2. Install the brake pedal assembly and tighten the flange nuts (booster mounting nuts) and bolt.

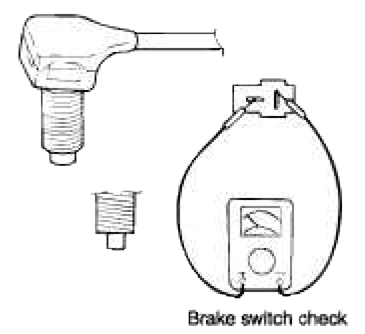

Stop lamp connector
Nuts
8-10 Nm (80-100kgf·cm, 6-7.3 lbf·ft)

3. Install the stop lamp switch.
4. Adjust the brake pedal height and free play. (Refer to "adjustment procedure")

INSPECTION

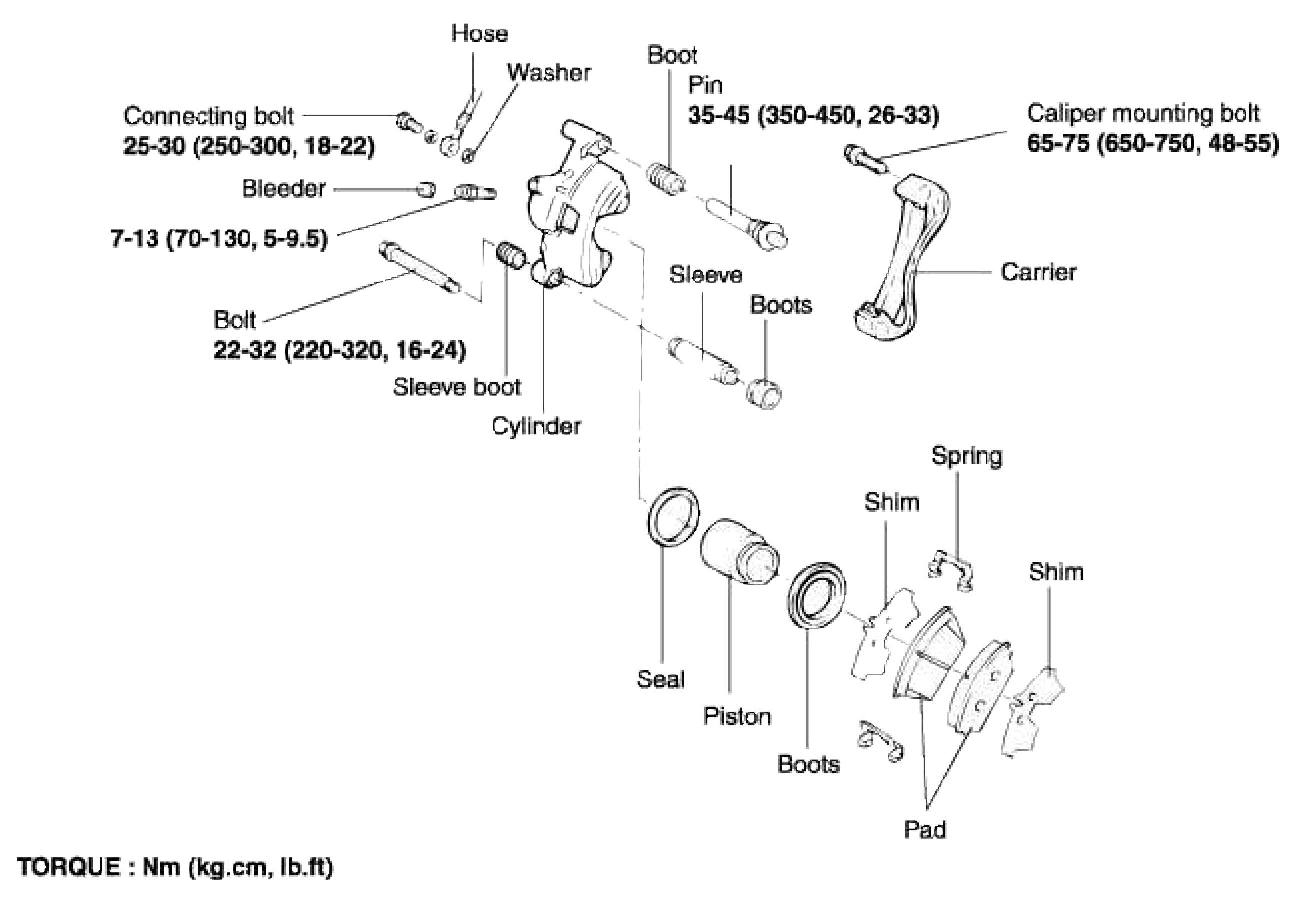
1. Check the bushing for wear.
2. Check the brake pedal for distortion.
3. Check the brake pedal return spring for damage.

4. Check the stop lamp switch.
   (1) With an ohmmeter connected to the stop lamp switch terminals, check for continuity.
   (2) If there is no continuity when the plunger is depressed and there is continuity when the plunger is released, the stop lamp switch is normal.


Brake switch check

Brake System > Brake System > Front Disc Brake > Components and Components Location

COMPONENTS



Hose
Washer
Boot
Pin
35-45 (350-450, 26-33)
Connecting bolt
25-30 (250-300, 18-22)
Caliper mounting bolt
65-75 (650-750, 48-55)
Bleeder
7-13 (70-130, 5-9.5)
Sleeve
Carrier
Boots
Bolt
22-32 (220-320, 16-24)
Sleeve boot
Cylinder
Spring
Shim
Shim
Seal
Piston
Boots
Pad
TORQUE : Nm (kg.cm, lb.ft)

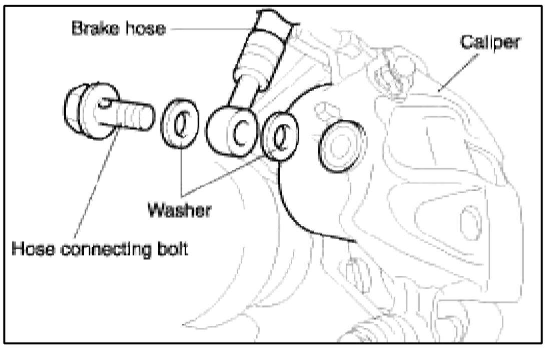
Brake System > Brake System > Front Disc Brake > Repair procedures

REMOVAL

CALIPER ASSEMBLY

1. Remove the wheel and tire.

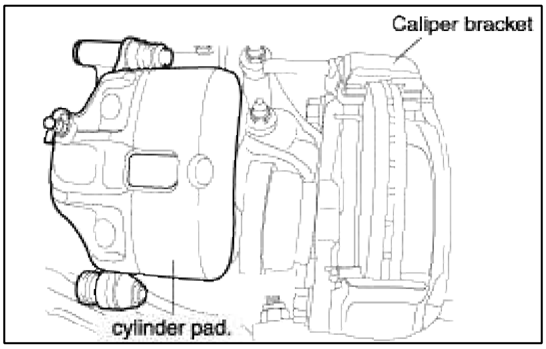
2. Disconnect the brake hose.


Brake hose
Caliper
Washer
Hose connecting bolt

CAUTION

- Do not brake fluid on the vehicle; it may damage the paint.
  If brake fluid does contact the paint, wash it off immediately with water.
- To prevent spills, plug the hose inlets with rags or shop towels.

3. Remove the cylinder mounting bolt.
4. Remove cylinder and pads from the caliper bracket.

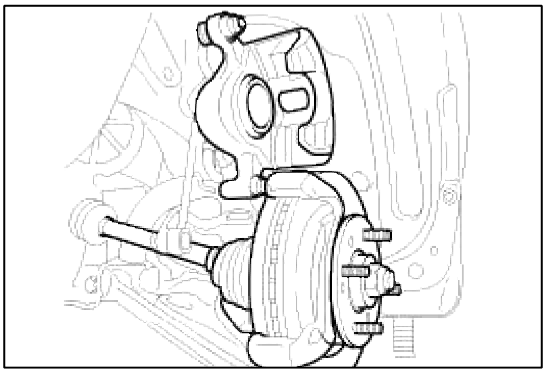

Caliper bracket
cylinder pad.

5. Remove the caliper mounting bolts from the knuckle.
6. Remove the caliper mounting bracket.

REPLACEMENT

REMOVAL

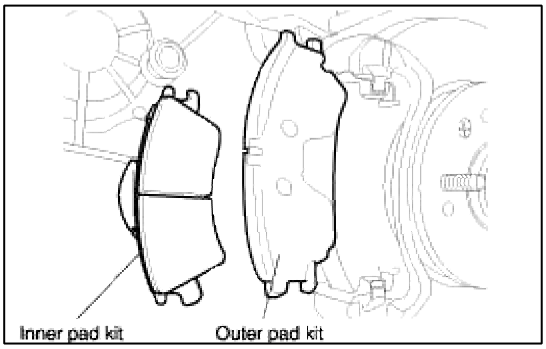
1. Remove the lower bolt and lift the caliper assembly up and secure it with a wire or some other retaining method.



2. Remove the pads.

CAUTION

Do not depress the brake pedal while disassembling the pads.



INSPECTION

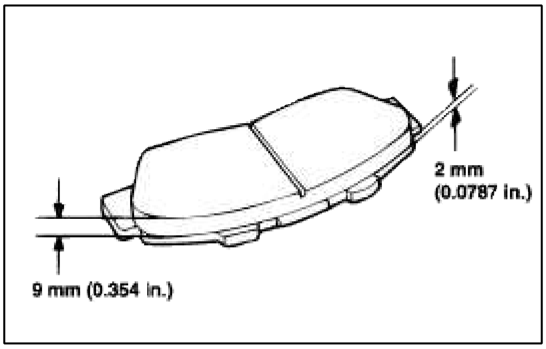
1. Check the pads for wear or oil contamination and replace, if necessary.

CAUTION

- The pads for the right and left wheels should be replaced at the same time. Never "drop" or intermix brake pad sets.
- All four pads must be replaced as a complete set.
- When replacing the brake pad, check for deformation. When replacing the guide spring, use a new one or the used one after cleaning away foreign material.

2. Check the pad for damage or deformation.

Brake pad thickness:
Standard value: 9 mm (0.354 in.)
Service limited value: 2 mm (0.0787 in.)



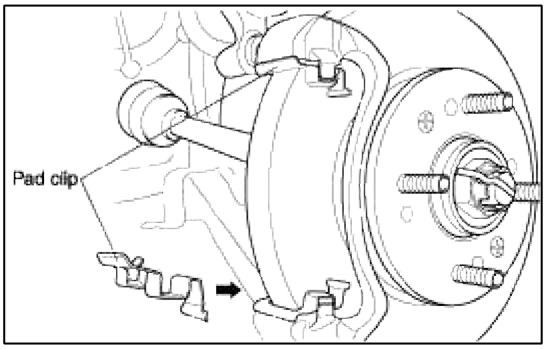
INSTALLATION

1. Install the pad clips.

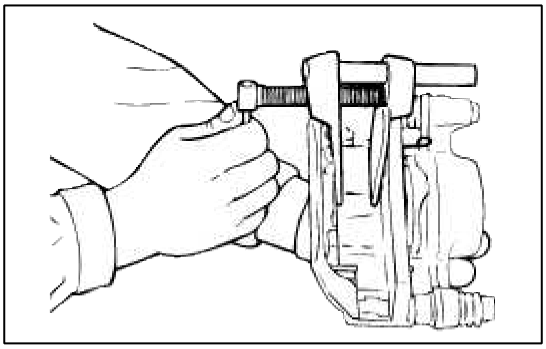
2. Install the pads onto each pad clip.

NOTE

Position the pad with its pad wear indicator upward on the piston side.



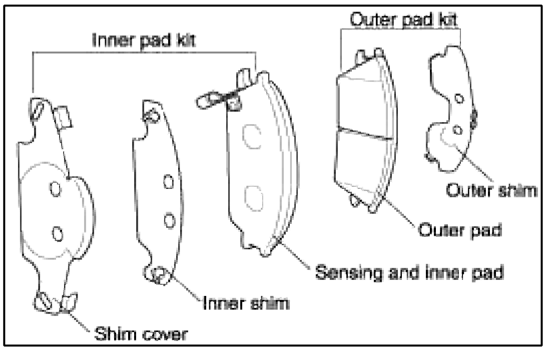
3. Insert the piston in the cylinder using the Special Tool (09581-11000).



4. Install the new pads. The shims are attached to each pad as illustrated.

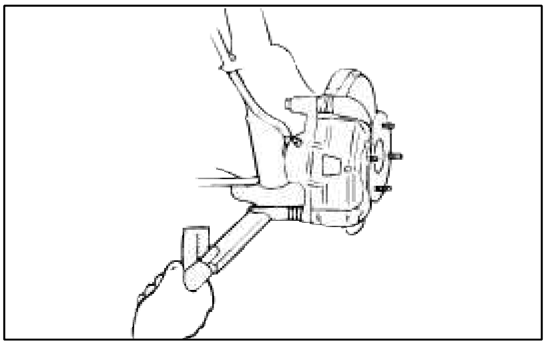
CAUTION

Be careful so that the disc or pad isn't contaminated by grease.


Outer pad kit
Inner pad kit
Outer shim
Outer pad
Sensing and inner pad
Inner shim
Shim cover

5. Install the bolt and tighten to the specified value.

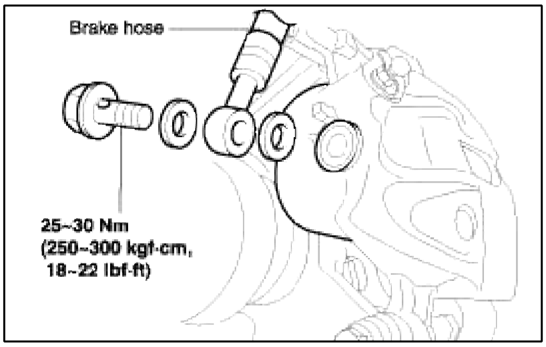
Tighting torque
Guide rod bolt: 22~32 Nm(220~320 kgf·cm, 16~24 lb·ft)



INSTALLATION

CALIPER ASSEMBLY

1. Be careful not to spill grease or oil on the pad and brake disc contact surface.
2. Tighten the caliper mounting bolt to the specified torque.
3. Install the brake hose.



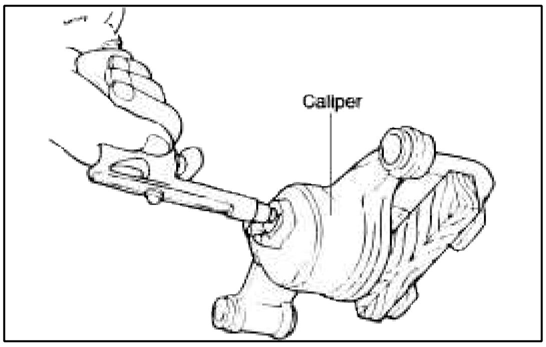
4. Bleed the system. (Refer to "Air bleeding" in adjustment procedure)

DISASSEMBLY

1. Remove the piston boot.
2. Remove the piston using compressed air.

NOTE

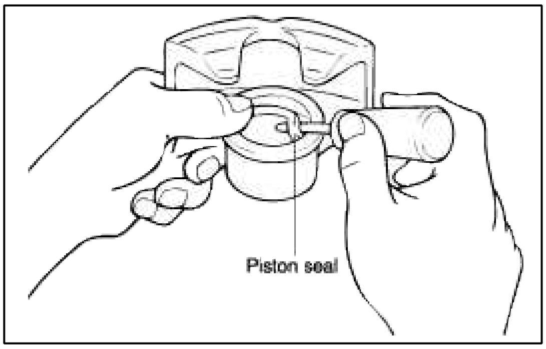
1. Do not put your fingers in front of the piston when using compressed air.
2. Be careful not to splatter the brake fluid.



3. Remove the piston seal from the caliper by using a screwdriver.

CAUTION

Do not damage the piston wall surface.



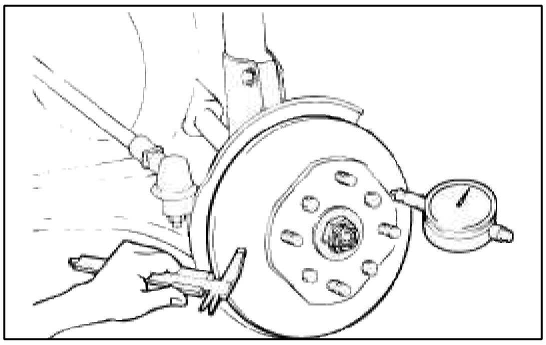
INSPECTION

1. Check the caliper for wear, damage, cracks and dust.
2. Check the piston for dust, damage, cracks and wear on the outer surface.
3. Check the sleeve and pin for damage and dust.
4. Check the pad spring and boots for damage.
5. Check the carrier for damage, dust, wear and cracks.

> CAUTION
>
> 1. Do not use sand paper on the piston surface.
> 2. All rubber parts must be replaced with new parts.

6. Inspect the disc by using a caliper and a dial gauge.

Thickness of disc mm (in.)
Standard value: 19 (0.75)
Service limit: 17 (0.67)
0.04 (0.002)
0.01 (0.0004)

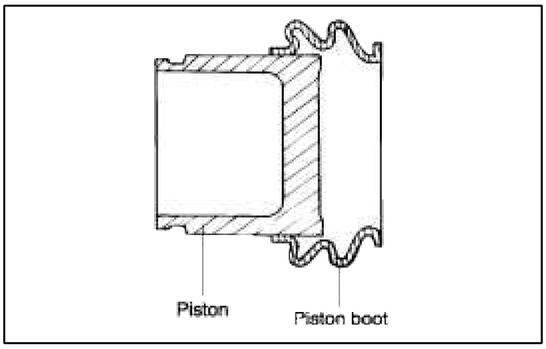


> NOTE
>
> 1. Using a micrometer, measure the disc thickness at eight positions approximately 10mm from the outer edge of the disc and at 45° intervals.
>   If you substract the minimum of measurements from the maximum, you get the difference of the disc thickness.
> 2. When measuring the disc runout, fix a dial gauge approximately 5mm from the outer edge of the disc, and rotate the disc 360°.
>   At this time, if you subtract the minimum of measurements from the maximum, you get the disc runout.

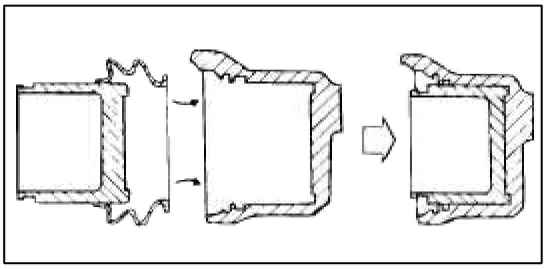
7. If necessary, replace the brake disc.

REASSEMBLY

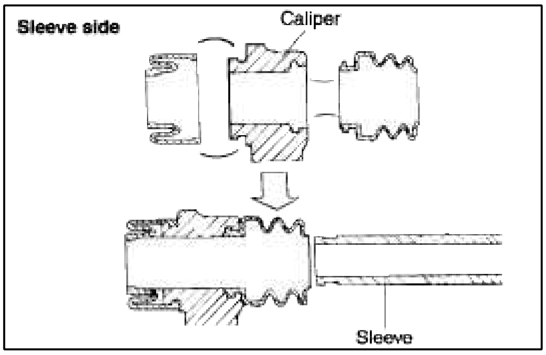
1. Clean all components except the pads and shims with isopropyl alcohol.
2. Apply rubber grease on the piston seal and install the piston seal in the cylinder.

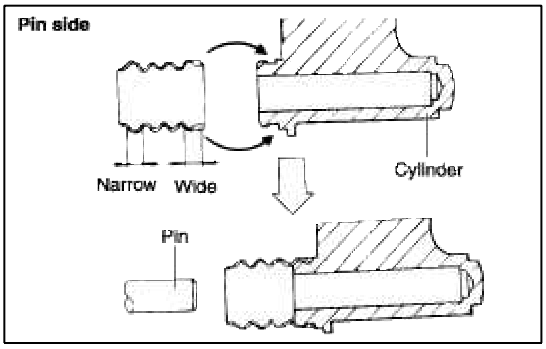


3. Assemble the piston and piston boots according to the following procedure.
   (1) Apply rubber grease to the caliper bore, the outside surface of the piston and the piston boot.
   (2) Install the piston boot on the piston as illustrated.
   (3) Insert the piston boot in the inner groove of the caliper and push the piston into the caliper.



4. Assemble the sliding parts according to the following procedure.
   (1) Apply rubber grease to the outside surface of the sleeve and pin, pin and sleeve bore of the caliper, pin boot and sleeve boot.
   (2) Insert the boot into the groove of the caliper.

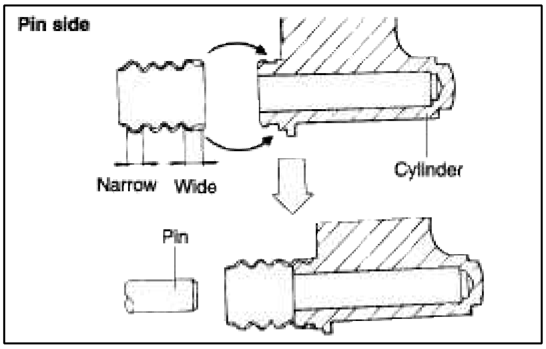

Sleeve side
Caliper
Sleeve


Pin side
Narrow
Wide
Cylinder
Pin

5. Install the pads.

NOTE

Be careful so that the disc or pad is not contaminated by grease.


Pin side
Narrow
Wide
Cylinder
Pin

6. Tighten the brake hose connecting bolt.

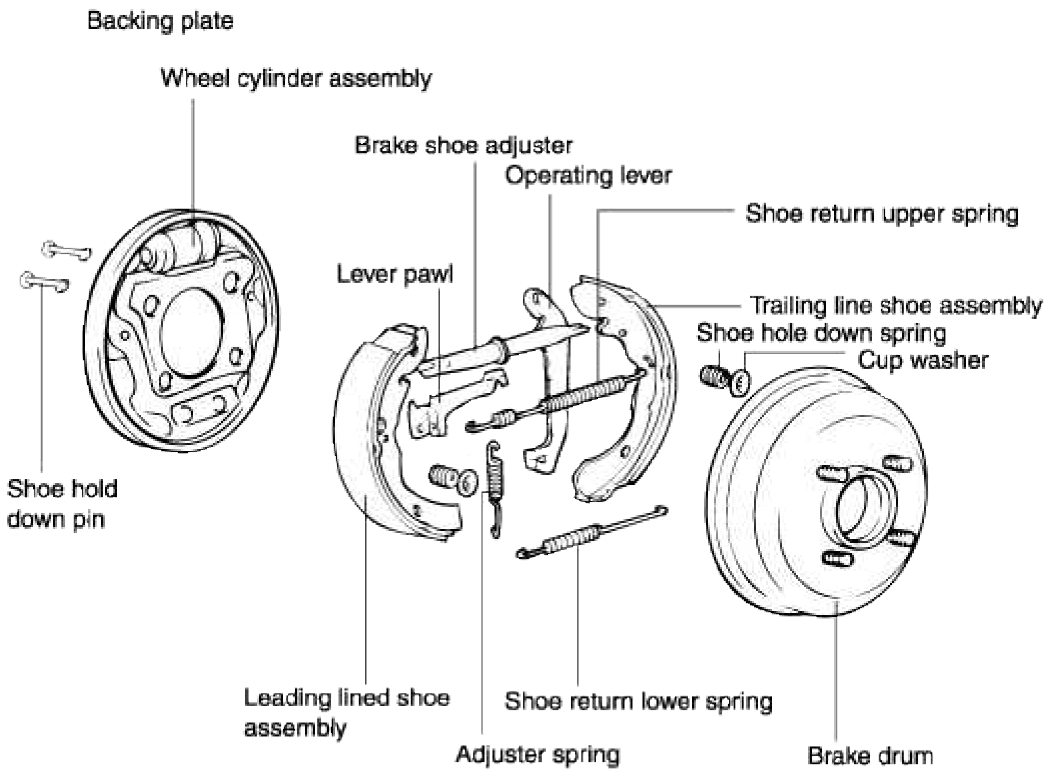
Tightening torque	Nm (kg·cm, lb·ft)
Sliding pin Sliding bolt Carrier mounting bolt Brake hose mounting oil bolt	34 - 44 (350-450, 26-33) 22 - 31 (220-320, 16-23) 64 - 74 (650-750, 48-54) 25 - 29 (250-300, 18-22)

NOTE

1. Check that the surface of the pin and bolts are not damaged before tightening.
2. Bleed the system. Depress the pedal several times and check for fluid leakage from all connecting parts.

Brake System > Brake System > Rear Drum Brake > Components and Components Location

COMPONENTS

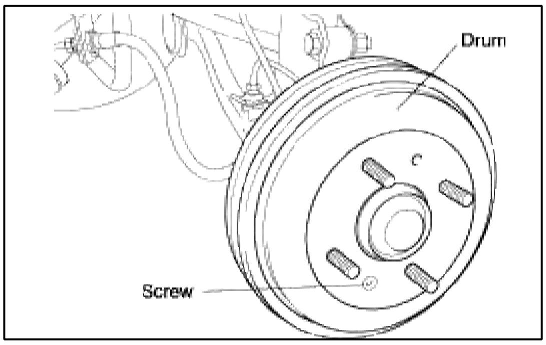

Backing plate
Wheel cylinder assembly
Brake shoe adjuster
Operating lever
Shoe return upper spring
Lever pawl
Trailing line shoe assembly
Shoe hole down spring
Cup washer
Shoe hold down pin
Leading lined shoe assembly
Shoe return lower spring
Adjuster spring
Brake drum

Brake System > Brake System > Rear Drum Brake > Repair procedures

REMOVAL

1. Release the parking brake.

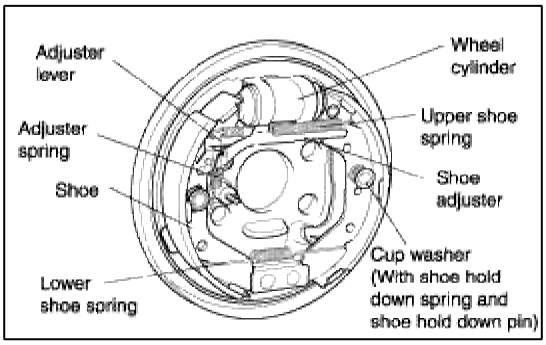
2. After removing the wheel, remove the brake drum.



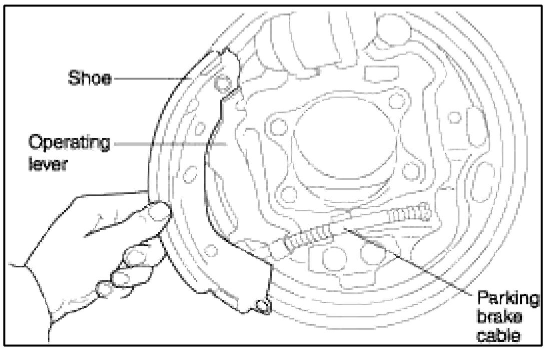
NOTE

When removing the brake drum, remove the screw.

3. Remove the adjuster spring and adjuster lever.
4. Remove the cup washer, shoe hold down spring, shoe hold down pin.
5. Move the shoe and remove the shoe adjuster.

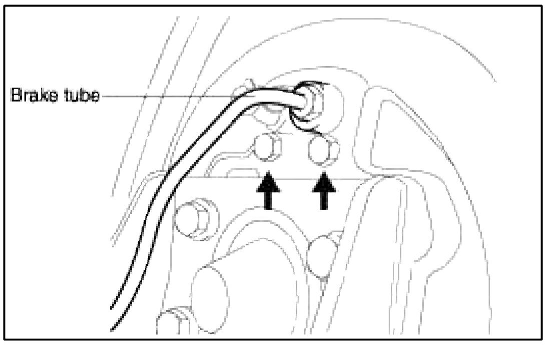

Adjuster lever
Adjuster spring
Shoe
Lower shoe spring
Wheel cylinder
Upper shoe spring
Shoe adjuster
Cup washer (With shoe hold down spring and shoe hold down pin)

6. Remove the lower shoe spring and upper shoe spring.
   Disconnect the parking cable from the operating lever.

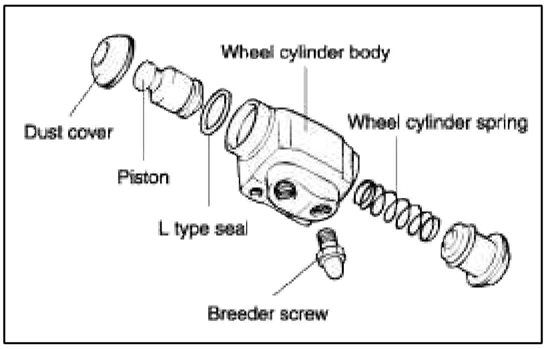

Shoe
Operating lever
Parking brake cable

REPLACMENT OF WHEEL CYLINDER

1. Remove the brake shoe.
2. Disconnect the brake tube.
3. Remove the wheel cylinder assembly.



4. Remove the dust boot.
5. Remove the piston and piston cup.
6. Remove the return spring.


Wheel cylinder body
Dust cover
Wheel cylinder spring
Piston
L type seal
Breeder screw

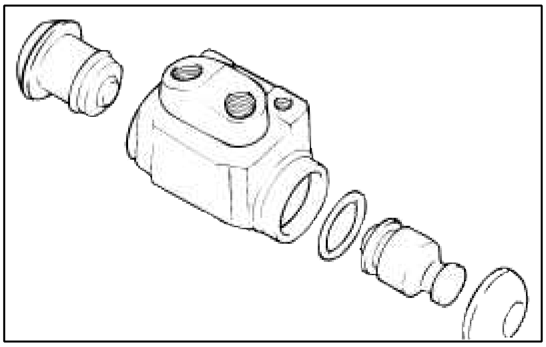
7. Before assembling the wheel cylinder, inspect the following.
   (1) Check the cylinder and piston for wear, damage and dust.
   (2) Check the cylinder body for damage and cracks.
   (3) Check the contact surface of the piston and shoes for wear.
   (4) Check the piston spring for looseness.
8. Assembly is the reverse of removal.

NOTE

1. Clean the cylinder and inner parts with isopropyl alcohol before assembly.
2. Apply enough brake fluid to the piston cups and cylinder.
3. Be sure to use new piston cups and dust boots.

CAUTION

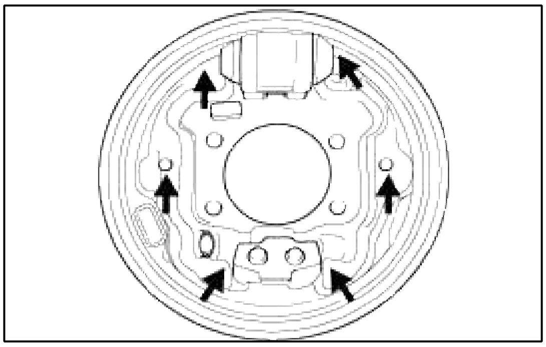
Be careful not to lose the steel ball in the bleeder.



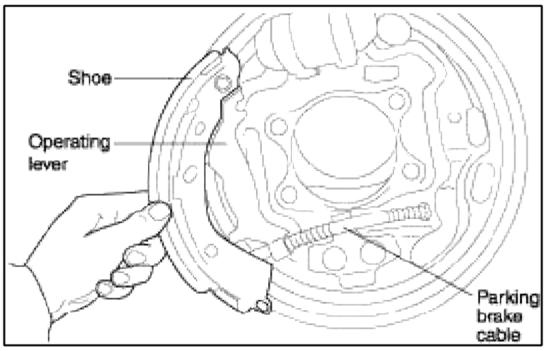
INSTALLTION

1. Apply the specified grease to the locations indicated in the illustration and to each component.
   - A. Shoe and backing plate contact surfaces.
   - B. Shoe and anchor plate contact surfaces.

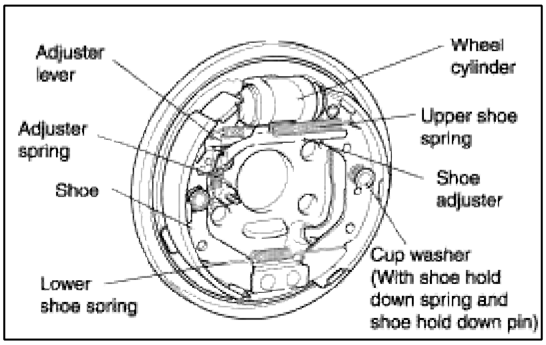
Recommended grease:
Multipurpose grease SAE J310, NLGI No.2



2. Connect the operating lever to the parking cable.


Shoe
Operating lever
Parking brake cable

3. Install the shoe hold-down pin.
4. Install the shoe adjuster and assemble the return spring.
5. Assemble the adjuster lever and adjuster spring.


Adjuster lever
Adjuster spring
Shoe
Lower shoe spring
Wheel cylinder
Upper shoe spring
Shoe adjuster
Cup washer (With shoe hold down spring and shoe hold down pin)

6. Assemble the drum and pull the parking brake lever to full stroke several times.

CAUTION

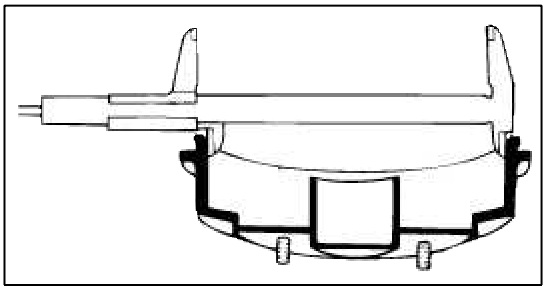
Be sure that the inside surface of drum is not contaminated by grease or other materials.

INSPECTION

1. Measure the inside diameter of the brake drum.
   Check the runout of the brake drum by using a dial indicator.

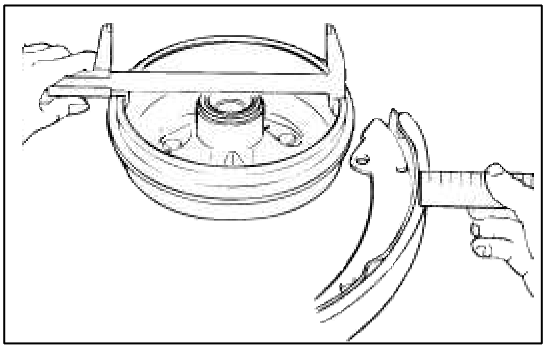
   Inside diameter mm (in.)
   Standard value: 180 (7.09)
   Service limit: 182 (7.17)

   Out-of-round (brake drum) mm (in.)
   Service limit: 0.05 (0.002)

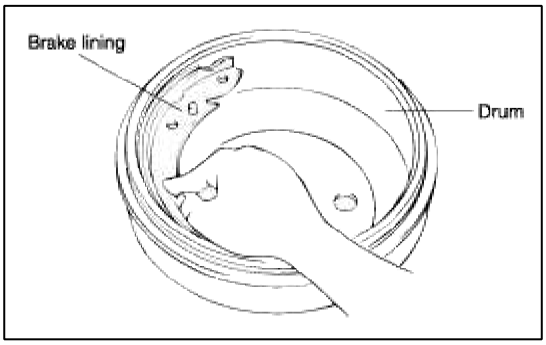


2. Measure the brake shoe lining thickness.

   Lining thickness mm (in.)
   Standard value: 4.8 (0.19)
   Service limit: 1 (0.04)



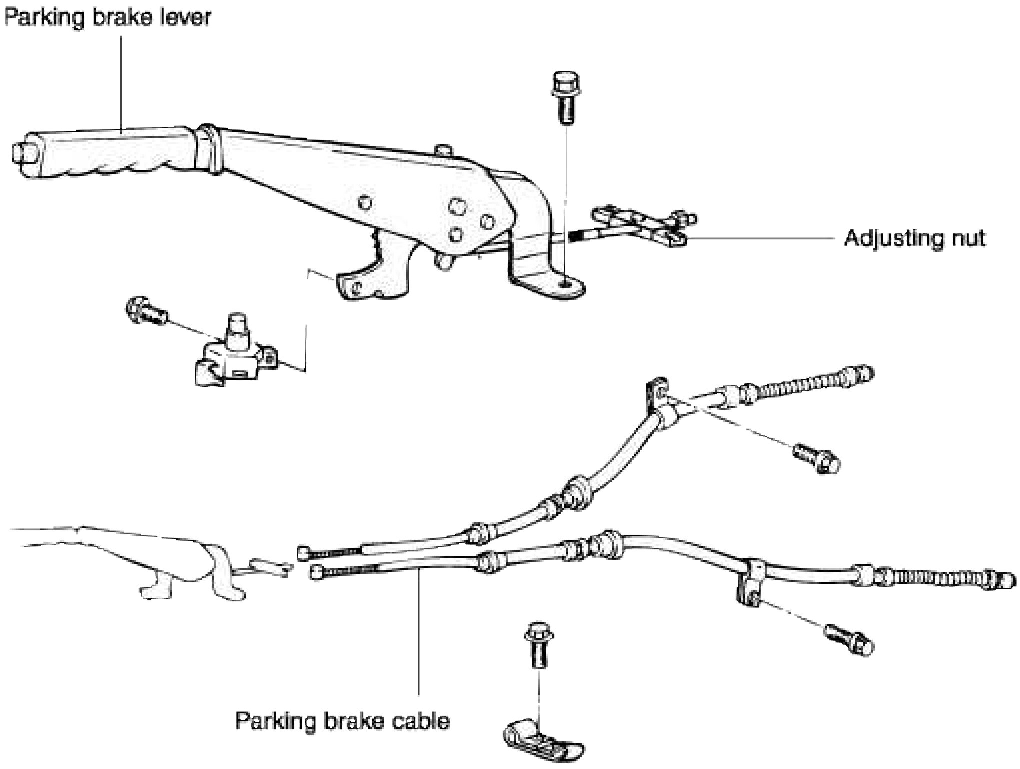
3. Inspect the brake lining and drum for proper contact.



4. Inspect the wheel cylinder outside for excessive wear and damage.
5. Inspect the backing plate for wear or damage.

Brake System > Parking Brake System > Parking Brake Assembly > Components and Components Location

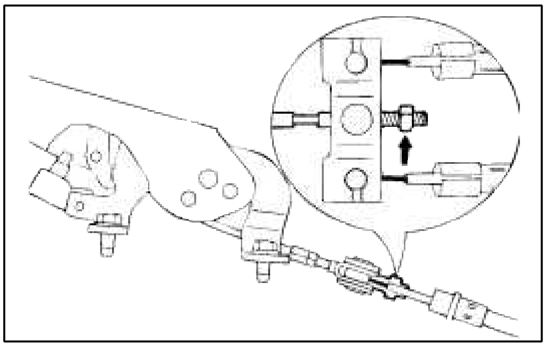
COMPONENTS


Parking brake lever
Adjusting nut
Parking brake cable

Brake System > Parking Brake System > Parking Brake Assembly > Repair procedures

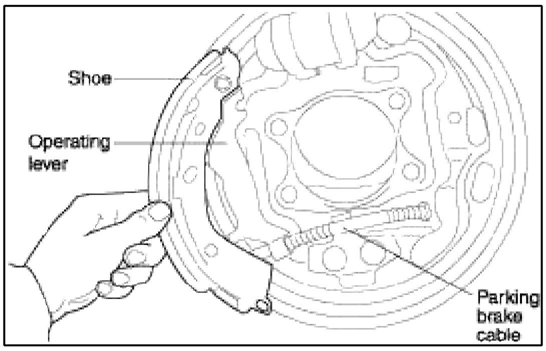
REMOVAL

1. Remove the console.
2. Loosen the adjusting nut and detach the parking brake cable.

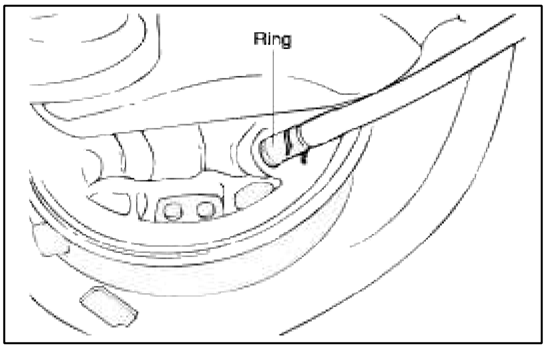


3. Detach the parking brake switch assembly.
4. Remove the parking brake lever assembly.
5. Remove the rear wheel.
6. Remove the brake drum.
7. Remove the rear hub assembly.
8. Remove the brake shoe.

9. Disconnect the parking brake cable from the brake shoe operating lever.



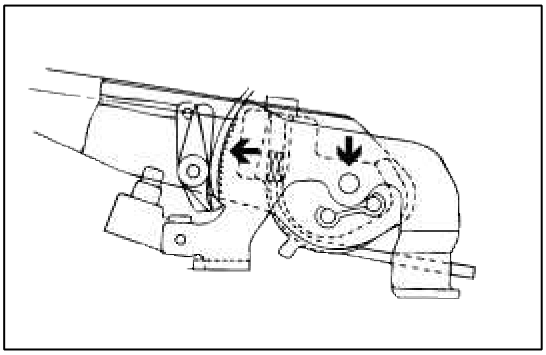
10. Remove the parking brake cable retaining ring in the rear of the backing plate.



11. Loosen the parking brake cable clamp and remove the parking brake cable assembly.

INSTALLATION

1. Installation is the reverse of removal.
2. Parking brake cable adjustment
    (1) Depress and release the brake pedal 20 times with a force of 10 kgf.
    (2) Pull the parking brake lever to full stroke more than 3 times.
    (3) When pulling up the point where is at a distance of 25mm (0.98 in.) from the end of the lever with a force of 20 kgf, adjust the adjusting nut to the lever assembly so that lever is fixed to 6~7 notches.

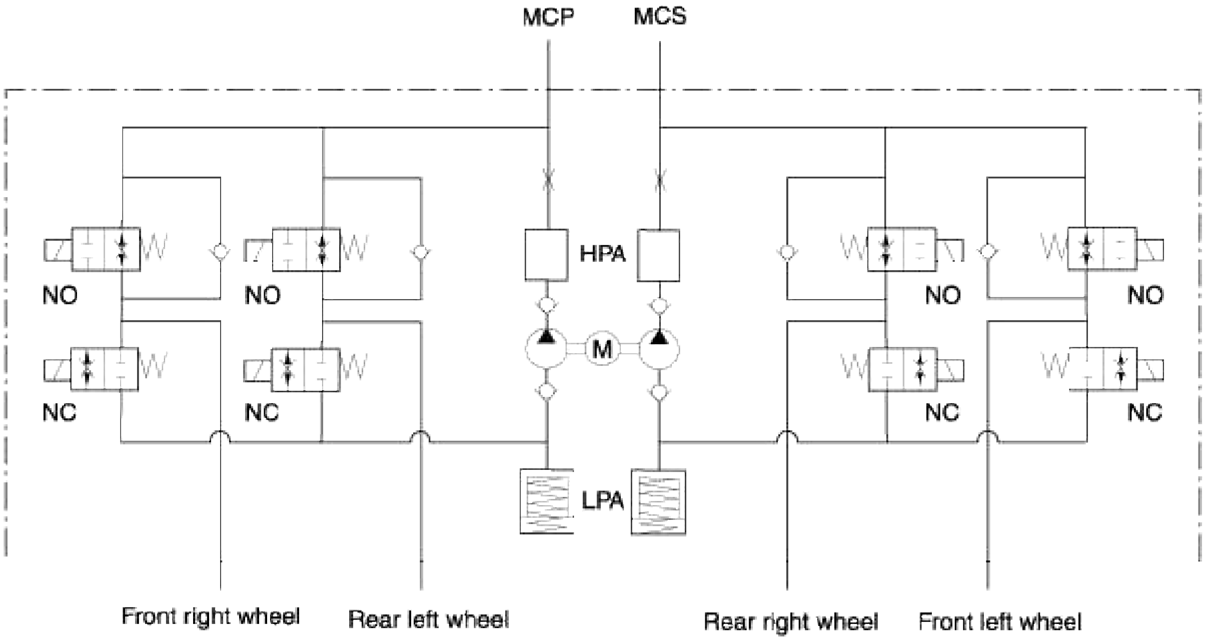


INSPECTION

1. Check the parking brake switch operation.
2. Check the parking brake lever ratchet for wear.
3. Check the parking brake cable for wear or damage.

Brake System > ABS(Anti-Lock Brake System) > Schematic Diagrams

HYDRAULIC SYSTEM DIAGRAM

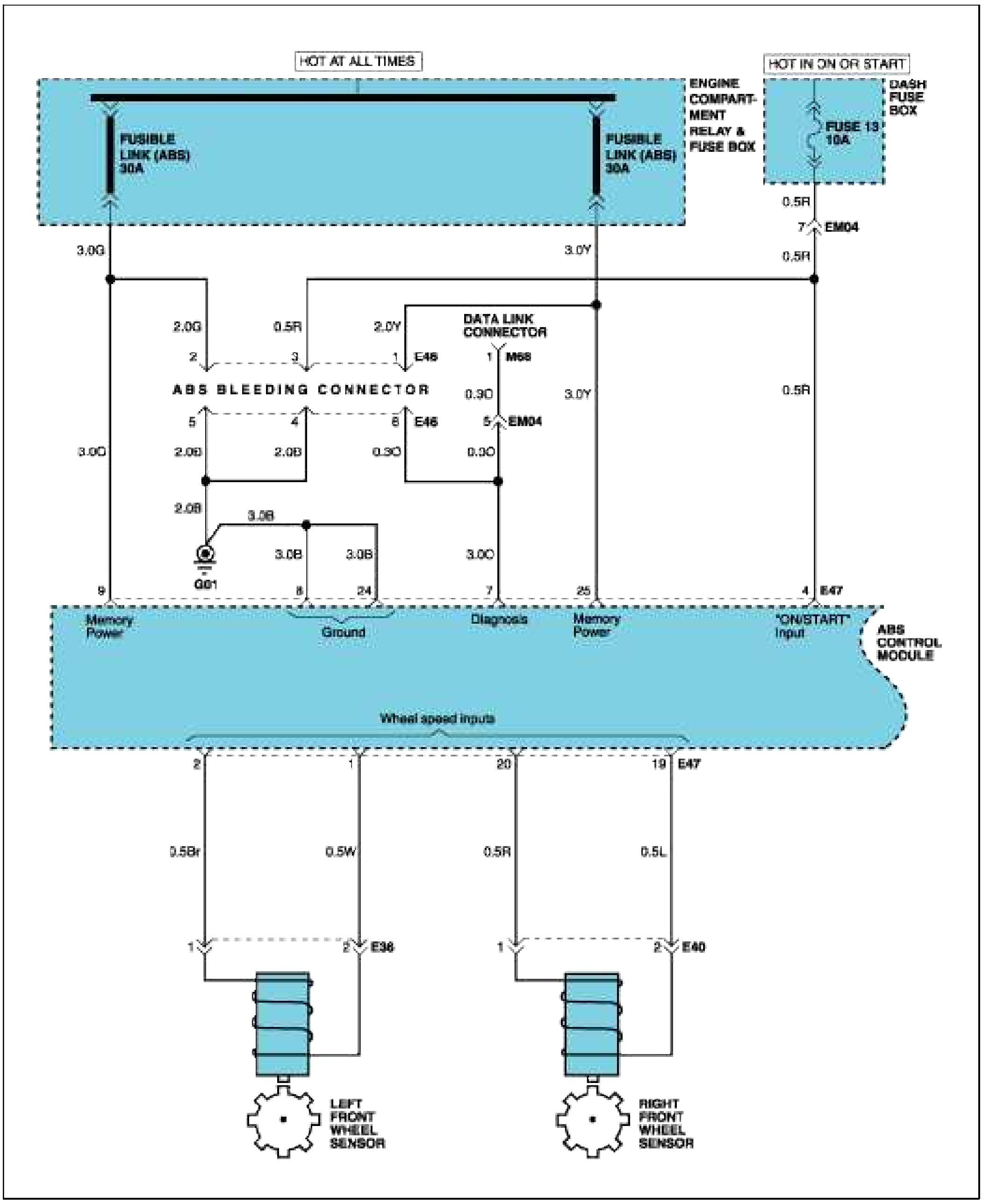

MCP
MCS
HPA
NO
NO
NO
NO
NC
NC
NC
NC
M
LPA
Front right wheel
Rear left wheel
Rear right wheel
Front left wheel

HPA : High Pressure Accumulator
LPA : Low Pressure Accumulator
M : Pump Motor

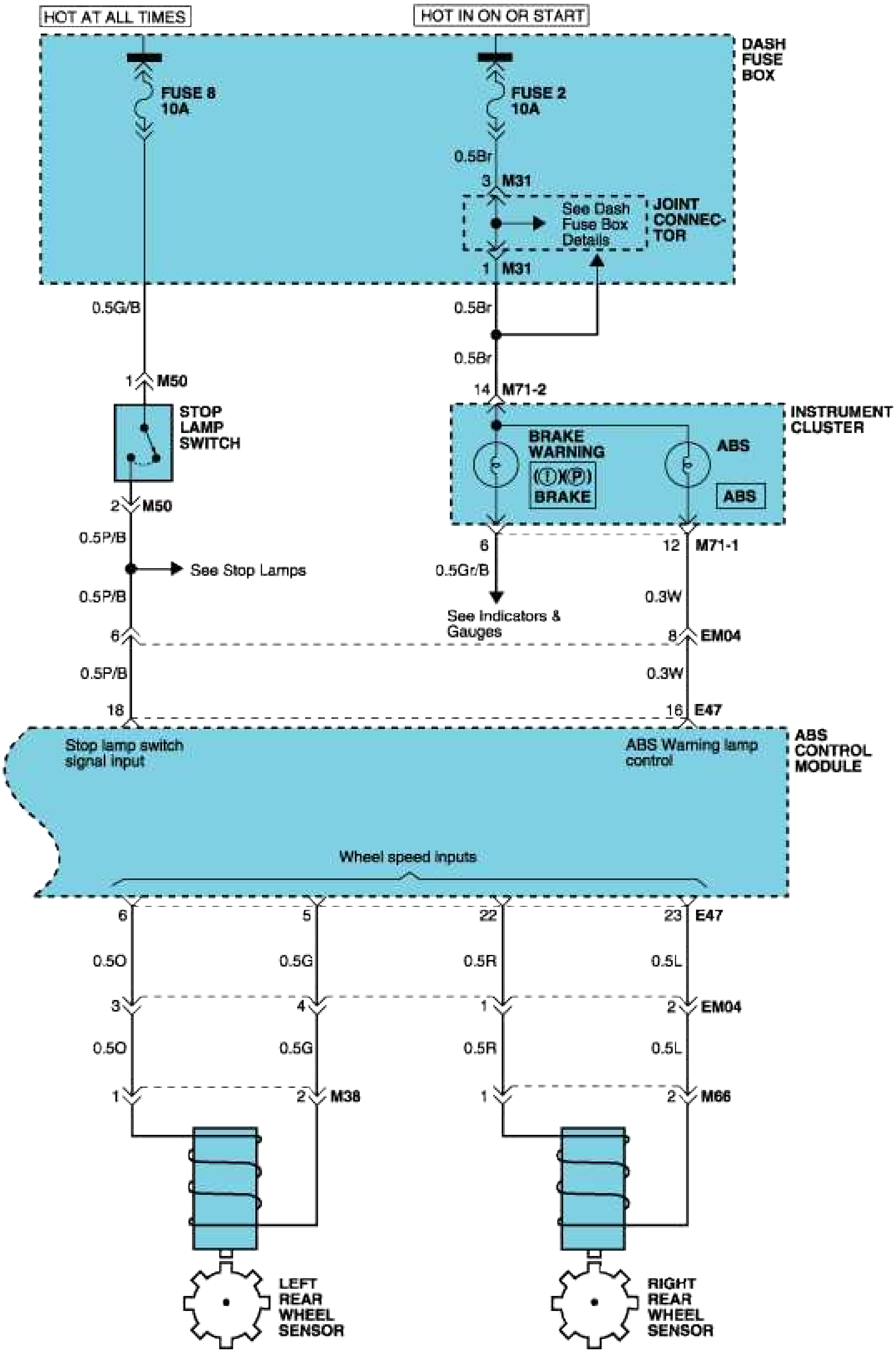
NO : Normal Open Valve
NC : Normal Close Valve
MCP : Master Cylinder Primary
MCS : Master Cylinder Secondary

CIRCUIT DIAGRAM

CIRCUIT DIAGRAM (1)


HOT AT ALL TIMES
HOT IN ON OR START
FUSIBLE LINK (ABS) 30A
FUSIBLE LINK (ABS) 30A
ENGINE COMPARTMENT RELAY & FUSE BOX
DASH FUSE BOX
FUSE 13 10A
0.5R
7 EM04
0.5R
3.0G
3.0Y
2.0G
0.5R
2.0Y
DATA LINK CONNECTOR
2
3
1 E46
1 M68
ABS BLEEDING CONNECTOR
0.3O
3.0Y
0.5R
5
4
6 E46
5 EM04
3.0O
2.0B
2.0B
0.3O
0.3O
2.0B
3.0B
3.0B
3.0B
3.0O
G01
9
8
24
7
25
4 E47
Memory Power
Ground
Diagnosis
Memory Power
"ON/START" Input
ABS CONTROL MODULE
Wheel speed inputs
2
1
20
19 E47
0.5Br
0.5W
0.5R
0.5L
1
2 E36
1
2 E40
LEFT FRONT WHEEL SENSOR
RIGHT FRONT WHEEL SENSOR

CIRCUIT DIAGRAM (2)


HOT AT ALL TIMES
HOT IN ON OR START
DASH FUSE BOX
FUSE 8 10A
FUSE 2 10A
0.5Br
3 M31
See Dash Fuse Box Details
JOINT CONNEC-TOR
1 M31
0.5G/B
0.5Br
0.5Br
1 M50
14 M71-2
STOP LAMP SWITCH
INSTRUMENT CLUSTER
BRAKE WARNING
(!)(P) BRAKE
ABS
ABS
2 M50
0.5P/B
See Stop Lamps
6
12 M71-1
0.5Gr/B
0.5P/B
0.3W
See Indicators & Gauges
6
8 EM04
0.5P/B
0.3W
18
16 E47
Stop lamp switch signal input
ABS Warning lamp control
ABS CONTROL MODULE
Wheel speed inputs
6
5
22
23 E47
0.5O
0.5G
0.5R
0.5L
3
4
1
2 EM04
0.5O
0.5G
0.5R
0.5L
1
2 M38
1
2 M66
LEFT REAR WHEEL SENSOR
RIGHT REAR WHEEL SENSOR

Brake System > ABS(Anti-Lock Brake System) > Description and Operation

DESCRIPTION

1. Enables steering around obstacles with a greater degree of certainty, even during emergency braking.
2. Enables stopping during emergency braking while keeping stability and steerability even on curves.

ABS CONTROL

1. NORMAL BRAKING

Solenoid valve	State	Valve	Passage	Pump motor
IN (NO)	OFF	OPEN	Master cylinder Wheel cylinder	OFF
OUT (NC)	OFF	CLOSE	Wheel cylinder Reservoir	

Under the normal braking, voltage is not supplied to the solenoid valve, inlet valve is opened and outlet valve is closed. When the brake is depressed, brake fluid is supplied to the wheel cylinder via solenoid valve to activate the brake. When the brake is released, brake fluid is back to the master cylinder via inlet valve and check valve.

2. DUMP MODE

Solenoid valve	State	Valve	Passage	Pump motor
IN (NO)	ON	CLOSE	Master cylinder Wheel cylinder	ON
OUT (NC)	ON	OPEN	Wheel cylinder Reservoir	

Under the emergency braking, if the wheels start to lock up, HECU sends a signal to the solenoid valve to decrease the brake fluid, then voltage is supplied to each solenoid. At this time inlet valve is closed and brake fluid is blocked from the master cylinder. Conversely outlet valve is opened and brake fluid passes through wheel cylinder to reservoir, resulting in pressure decrease.

3. HOLD MODE

Solenoid valve	State	Valve	Passage	Pump motor
IN (NO)	ON	CLOSE	Master cylinder Wheel cylinder	ON
OUT (NC)	OFF	CLOSE	Wheel cylinder Reservoir	

When the brake fluid pressure is maximally decreased in wheel cylinder, HECU sends a signal to solenoid valve to keep the fluid pressure, voltage is supplied to inlet valve but it is not supplied to outlet valve. At this time inlet and outlet valves are closed and brake fluid is kept in wheel cylinder.

4. INCREASE MODE

Solenoid valve	State	Valve	Passage	Pump motor
IN (NO)	OFF	OPEN	Master cylinder Wheel cylinder	ON
OUT (NC)	OFF	CLOSE	Wheel cylinder Reservoir	

If HECU determines there's no lock-up in the wheel, HECU cuts voltage to solenoid valve. So voltage is not supplied to each solenoid valve, brake fluid passes through the inlet valve to wheel cylinder, resulting in pressure increase.

EBD (ELECTRONIC BRAKE-FORCE DISTRIBUTION) SYSTEM

The EBD system (Electronic Brake force Distribution) as a sub-system of the ABS system is to control the effective adhesion utilization by the rear wheels.

It further utilizes the efficiency of highly developed ABS equipment by controlling the slip of the rear wheels in the partial braking range.

The brake force is moved even closer to the optimum and controlled electronically, thus dispensing with the need for the proportioning valve.

The proportioning valve, because of a mechanical device, has limitations to achieve an ideal brake force distribution to the rear wheels.

As Well as to carry out the flexible brake force distribution proportioning to the vehicle load or weight increasing.

And in the event of malfunctioning, driver cannot notice whether it fails or not.

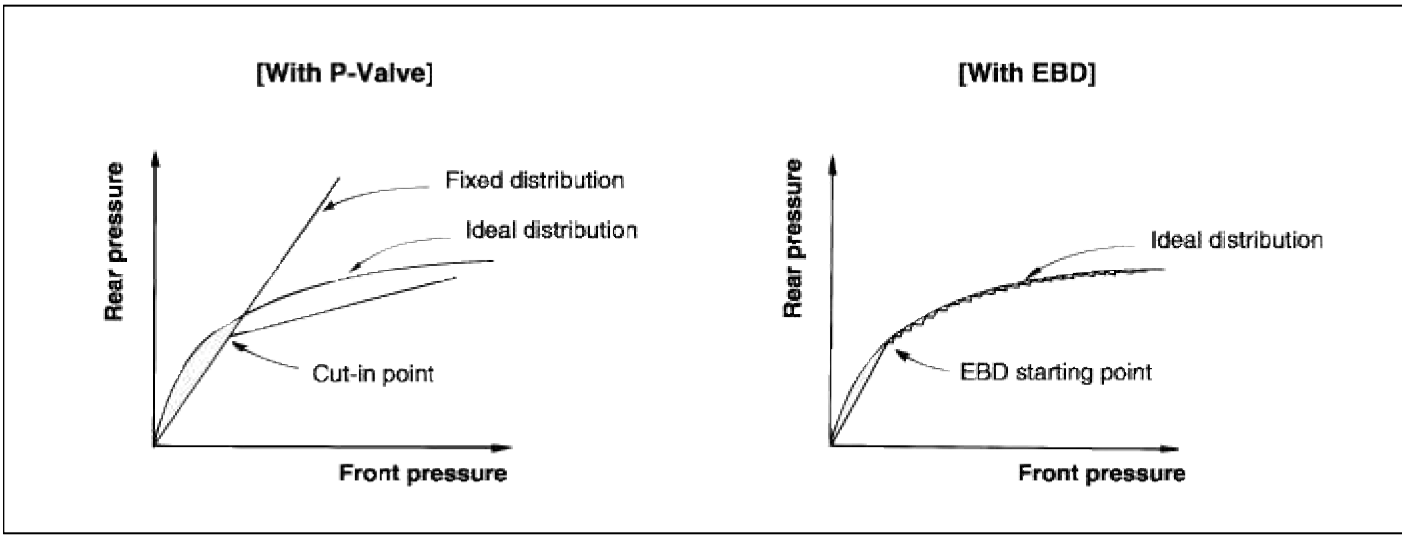
EBD controlled by the ABS Control Module, calculates the slip ratio of each wheel at all times and controls the brake pressure of the rear wheels not to exceed that of the front wheels.

If the EBD fails, the EBD warning lamp (Parking brake lamp) lights up.

ADVANTAGES

- Function improvement of the base-brake system.
- Compensation for the different friction coefficients.
- Elimination of the proportioning valve.
- Failure recognition by the warning lamp.

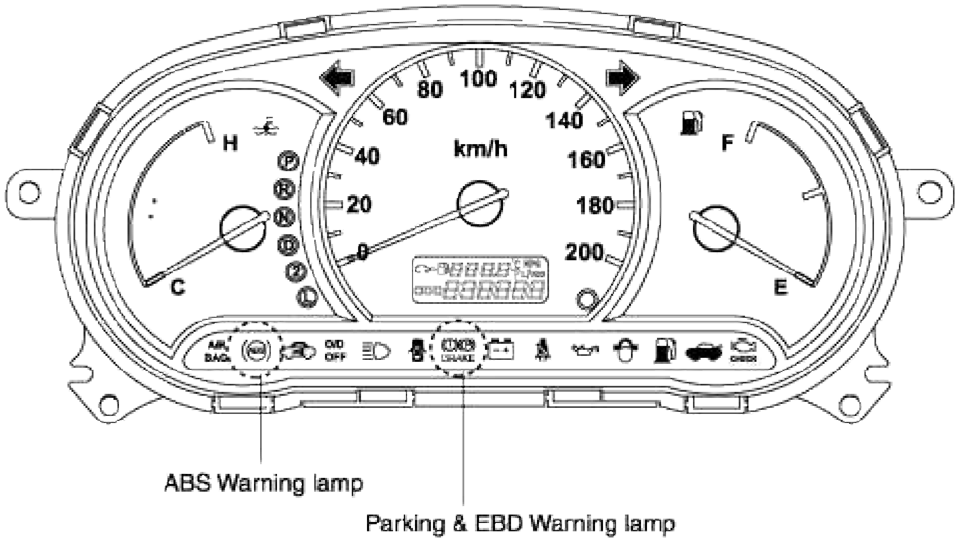
COMPARISON BETWEEN PROPORTIONING VALVE AND EBD



FAIL SAFE

FAIL CAUSE	SYSTEM		WARNING LAMP	
	ABS	EBD	ABS	EBD
None	ON	ON	OFF	OFF
Stop lamp switch failure	ON	ON	OFF	OFF
One wheel speed sensor failure	OFF	ON	ON	OFF
Pump malfunction	OFF	ON	ON	OFF
Low voltage	OFF	ON	ON	OFF
Two or more wheel speed sensor failure Solenoid valve failure HECU malfunction Over voltage Valve relay failure Other failure	OFF	OFF	ON	ON

WARNING LAMP CONTROL


H
C
P
R
N
D
2
L
0
20
40
60
80
100
120
140
160
180
200
km/h
F
E
AIR BAG
O/D OFF
BRAKE
CHECK
ABS Warning lamp
Parking & EBD Warning lamp

1. ABS warning lamp module

   The active ABS warning lamp module indicates the operating condition of the ABS.
   The ABS warning lamp is turned on under the following conditions.

   A. During the initialization phase after ignition switch ON. (3 seconds)
   B. In the event of inhibition of ABS functions by failure.
   C. When the system ECU is shut down even though ignition power is applied.
   D. During diagnostic mode.

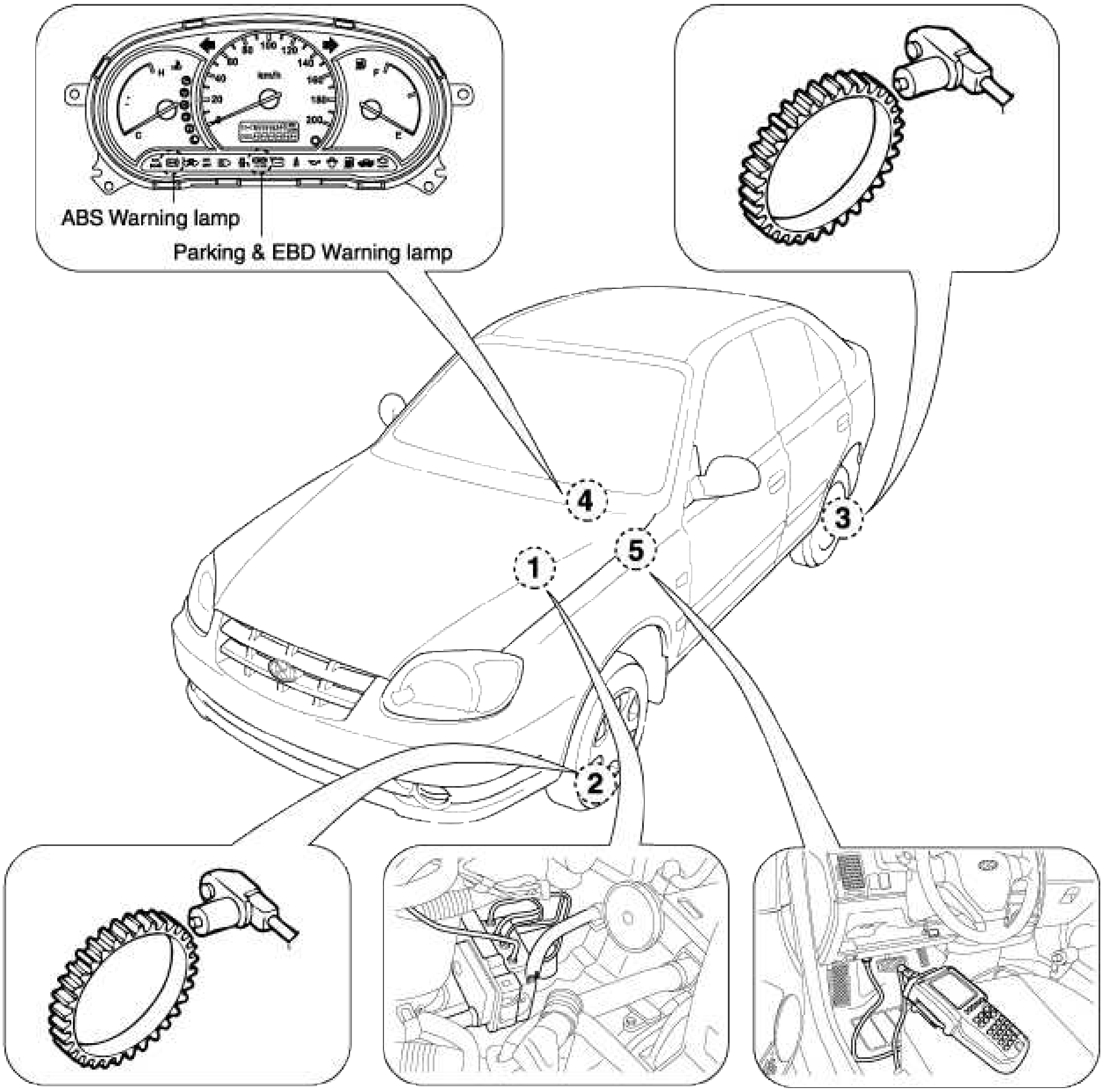
2. EBD warning lamp module

   The active EBD warning lamp module indicates the operating condition of the EBD. However, in case the parking brake switch is turned on, the EBD warning lamp is always turned on regardless of EBD functions. The EBD warning lamp is turned on under the following conditions.

   A. During the initialization phase after ignition switch ON. (3 seconds)
   B. In the event of inhibition of EBD functions by failure.
   C. When the system ECU is shut down even though ignition power is applied.
   D. When the parking brake switch is ON or brake fluid is low level.

Brake System > ABS(Anti-Lock Brake System) > Components and Components Location

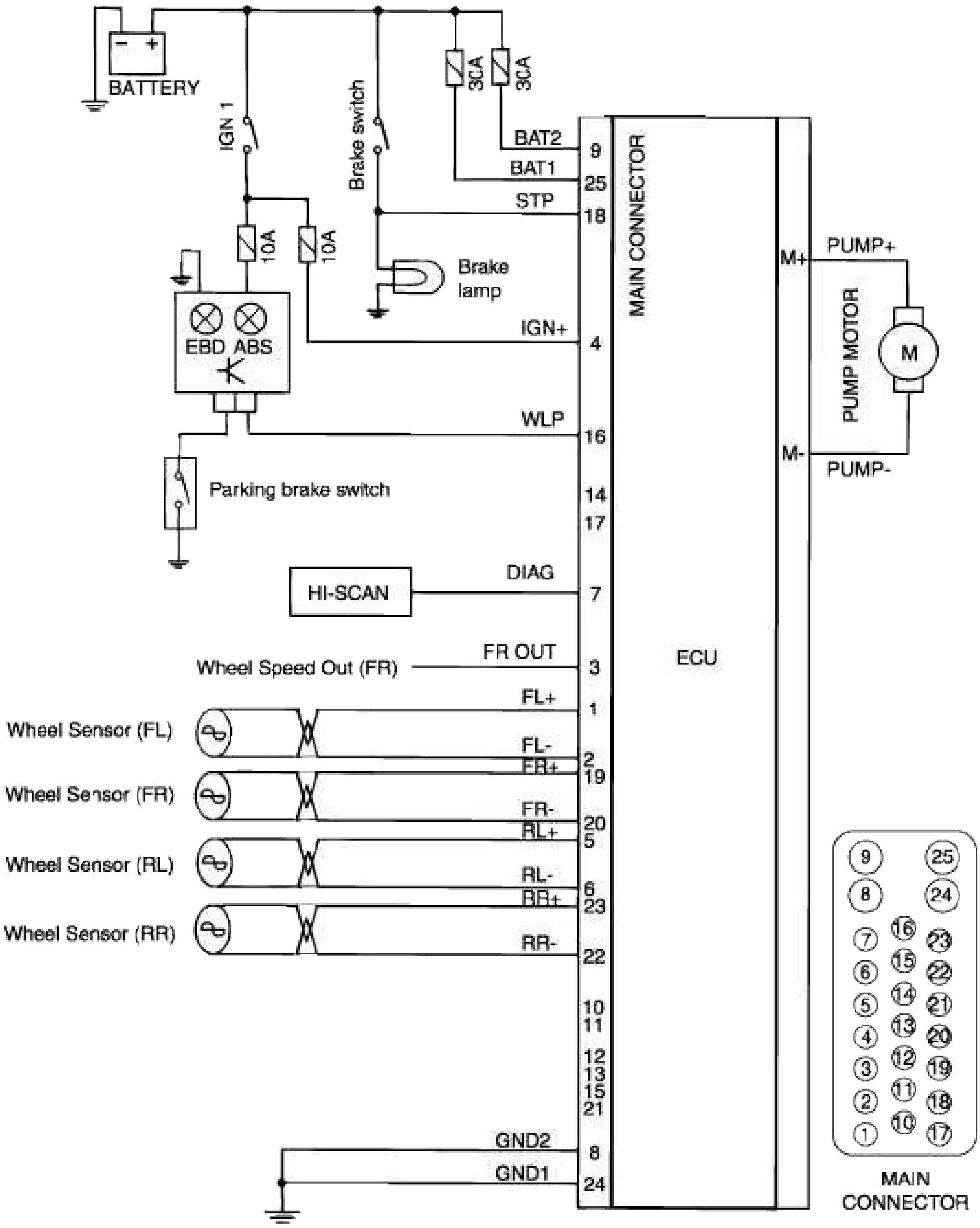
COMPONENTS


ABS Warning lamp
Parking & EBD Warning lamp
1
2
3
4
5

1. ABS Control module (HECU)
2. Front wheel speed sensor
3. Rear wheel speed sensor
4. ABS/EBD Warning lamp
5. Diagnosis

Brake System > ABS(Anti-Lock Brake System) > ABS Control Module > Schematic Diagrams

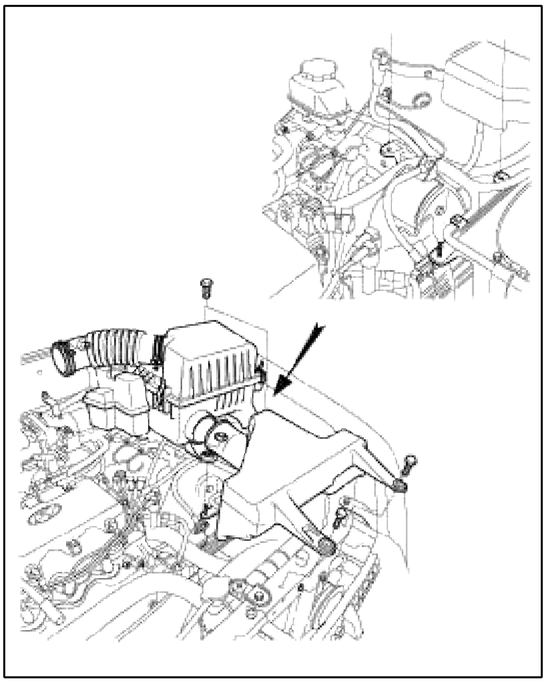
CIRCUIT DIAGRAM


BATTERY
IGN 1
Brake switch
30A
30A
10A
10A
EBD
ABS
Brake lamp
Parking brake switch
HI-SCAN
Wheel Speed Out (FR)
Wheel Sensor (FL)
Wheel Sensor (FR)
Wheel Sensor (RL)
Wheel Sensor (RR)
BAT2
BAT1
STP
IGN+
WLP
DIAG
FR OUT
FL+
FL-
FR+
FR-
RL+
RL-
RR+
RR-
GND2
GND1
9
25
18
4
16
14
17
7
3
1
2
19
20
5
6
23
22
10
11
12
13
15
21
8
24
MAIN CONNECTOR
ECU
M+
M-
PUMP+
PUMP-
PUMP MOTOR
M
MAIN CONNECTOR

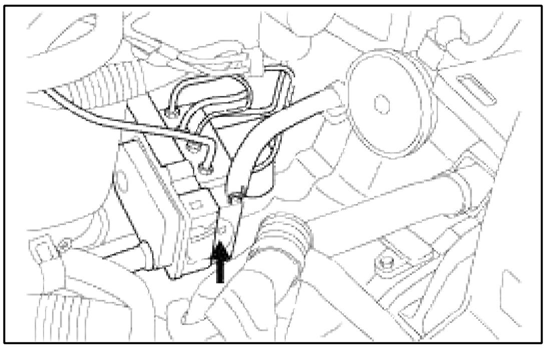
Brake System > ABS(Anti-Lock Brake System) > ABS Control Module > Repair procedures

REMOVAL

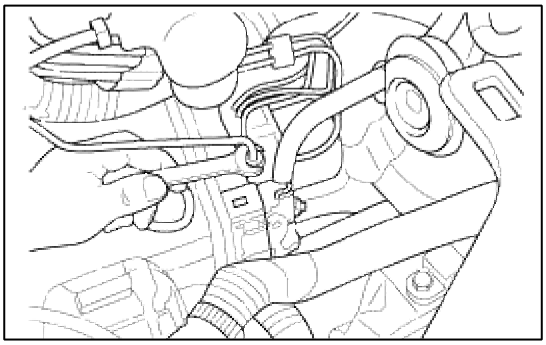
1. Remove the air-cleaner and the intake hose.



2. Disconnect the double lock connector from the HECU.



3. Disconnect the brake tubes from the HECU.



NOTE

- Do not spill brake fluid on the vehicle; it may damage the paint.
  If brake fluid gets on the paint, wash it off immediately with water.
- Take care not to damage or deform the brake lines during removal and installation.
- To prevent the brake fluid from flowing, plug and cover the hose ends and joints with a shop towel or equivalent material.

4. Remove the HECU bracket mounting bolts and remove the HECU.

CAUTION

1. Never attempt to disassemble the HECU.
2. The HECU must be transported and stored in an upright position and with the ports sealed.
   The HECU must not be drained.

Tightening torque
HECU bracket mounting bolt:
8 ~ 10 Nm (80 ~ 100 kg cm, 6 ~ 7.3 lb ft)

INSTALLATION

1. Install the HECU, then connect the brake lines.

Tightening torque
HECU mounting bolt:
8 ~ 10 Nm (80 ~ 100 kg·cm, 6 ~ 7.3 lb·ft)
Brake tube nut:
13 ~ 17 Nm (130 ~ 170 kg·cm, 10~12 lb·ft)

2. Connect the HECU connector.
3. Bleed the brake system.
4. Start the engine, and check that the ABS indicator goes off.
5. Test-drive the vehicle, and check that the ABS indicator does not come on.

ABS OPERATION CHECK

WHEEL SPEED SENSOR OUTPUT VOLTAGE CHECK

1. Raise the vehicle and release the parking brake.
2. Disconnect the HECU harness connector’s and measure from the harness side connector.

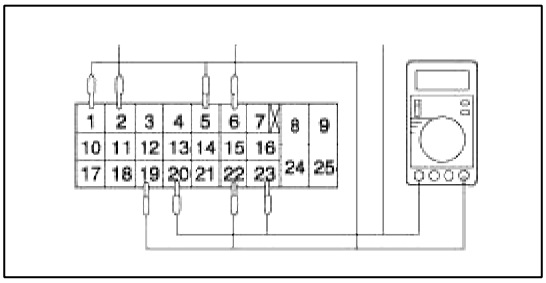
CAUTION

Be sure to remove the connector’s double lock and insert the probe into the harness side (back-probe). Inserting it into the terminal side may result in a bad connection.

3. Rotate the wheel to be measured approximately 1/2 to 1 rotation per second, and check the output voltage using a circuit tester or an oscilloscope.

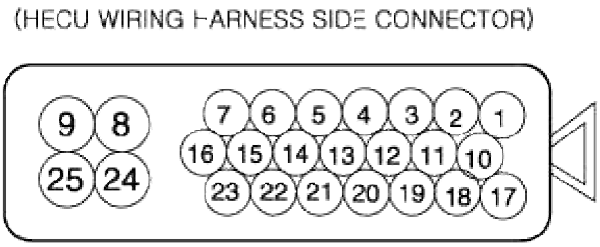
Wheel Speed Sensor	**Front left**	**Front right**	**Rear left**	**Rear right**
Terminal	1	19	5	22
	2	20	6	23

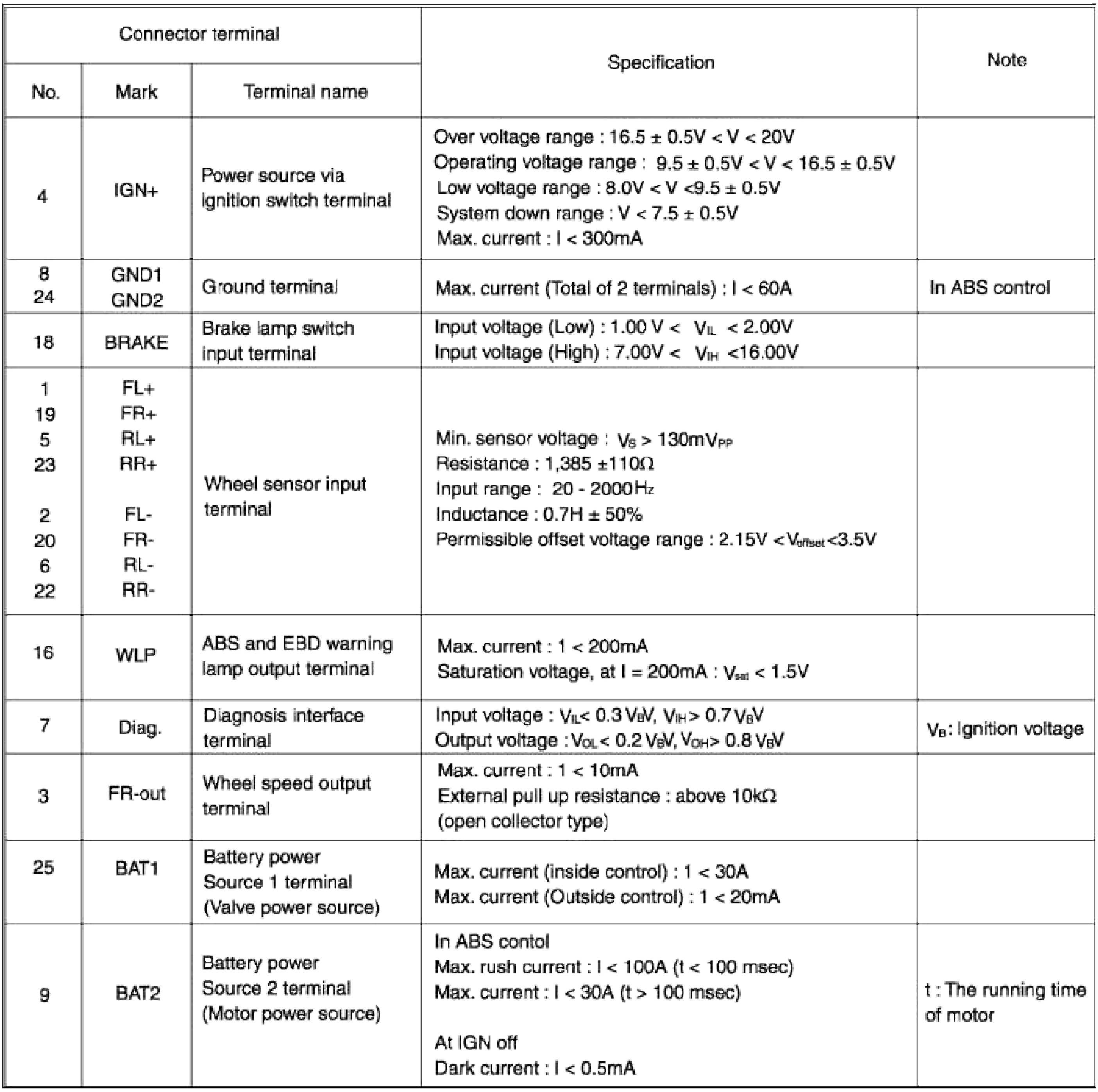
Output voltage :
When measuring with an oscilloscope : 130mV peak-to-peak or more


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

Brake System > ABS(Anti-Lock Brake System) > ABS Control Module > Specifications

INSPECTION AT HECU TERMINALS

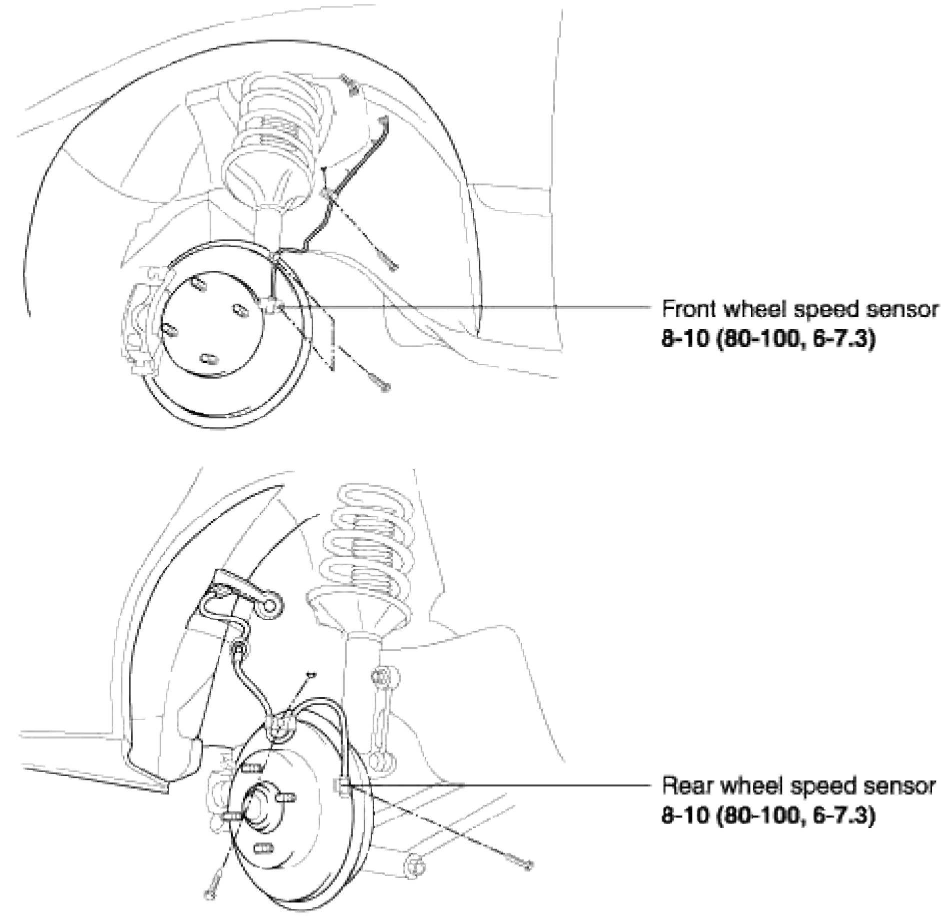

(HECU WIRING HARNESS SIDE CONNECTOR)
9
8
25
24
7
6
5
4
3
2
1
16
15
14
13
12
11
10
23
22
21
20
19
18
17



Connector terminal			Specification	Note
No.	Mark	Terminal name		
4	IGN+	Power source via ignition switch terminal	Over voltage range : 16.5 ± 0.5V < V < 20V Operating voltage range : 9.5 ± 0.5V < V < 16.5 ± 0.5V Low voltage range : 8.0V < V <9.5 ± 0.5V System down range : V < 7.5 ± 0.5V Max. current : I < 300mA	
8 24	GND1 GND2	Ground terminal	Max. current (Total of 2 terminals) : I < 60A	In ABS control
18	BRAKE	Brake lamp switch input terminal	Input voltage (Low) : 1.00 V < V_{IL} < 2.00V Input voltage (High) : 7.00V < V_{IH} <16.00V	
1 19 5 23 2 20 6 22	FL+ FR+ RL+ RR+ FL- FR- RL- RR-	Wheel sensor input terminal	Min. sensor voltage : $V_S > 130mV_{PP}$ Resistance : 1,385 ±110Ω Input range : 20 - 2000Hz Inductance : 0.7H ± 50% Permissible offset voltage range : 2.15V <V_{offset}<3.5V	
16	WLP	ABS and EBD warning lamp output terminal	Max. current : 1 < 200mA Saturation voltage, at I = 200mA : V_{sat} < 1.5V	
7	Diag.	Diagnosis interface terminal	Input voltage : V_{IL}< 0.3 V_BV, V_{IH}> 0.7 V_BV Output voltage : V_{OL}< 0.2 V_BV, V_{OH}> 0.8 V_BV	V_B: Ignition voltage
3	FR-out	Wheel speed output terminal	Max. current : 1 < 10mA External pull up resistance : above 10kΩ (open collector type)	
25	BAT1	Battery power Source 1 terminal (Valve power source)	Max. current (inside control) : 1 < 30A Max. current (Outside control) : 1 < 20mA	
9	BAT2	Battery power Source 2 terminal (Motor power source)	In ABS contol Max. rush current : I < 100A (t < 100 msec) Max. current : I < 30A (t > 100 msec) At IGN off Dark current : I < 0.5mA	t : The running time of motor

Brake System > ABS(Anti-Lock Brake System) > Front Wheel Speed Sensor > Components and Components Location

COMPONENTS


Front wheel speed sensor
8-10 (80-100, 6-7.3)
Rear wheel speed sensor
8-10 (80-100, 6-7.3)

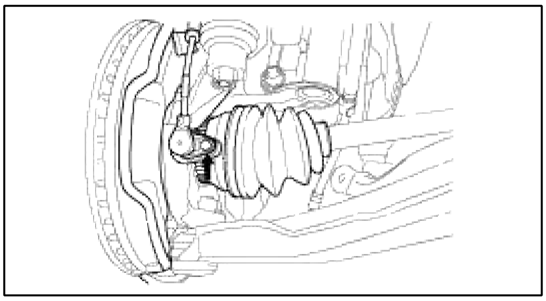
TORQUE : Nm (kg·cm, lb·ft)

Brake System > ABS(Anti-Lock Brake System) > Front Wheel Speed Sensor > Repair procedures

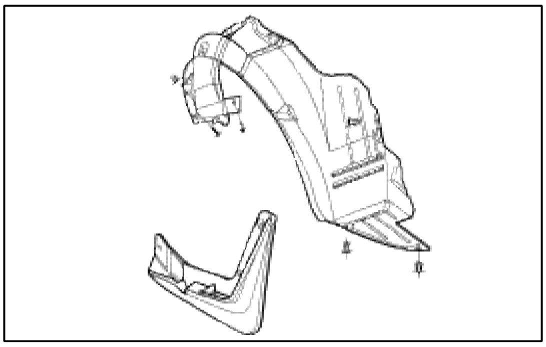
REMOVAL

FRONT WHEEL SPEED SENSOR

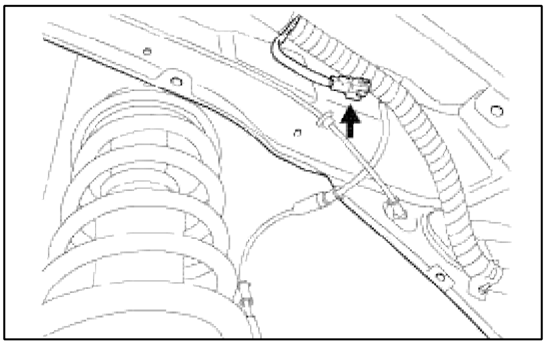
1. Remove the front wheel speed sensor mounting bolt.



2. Remove the front wheel guard.

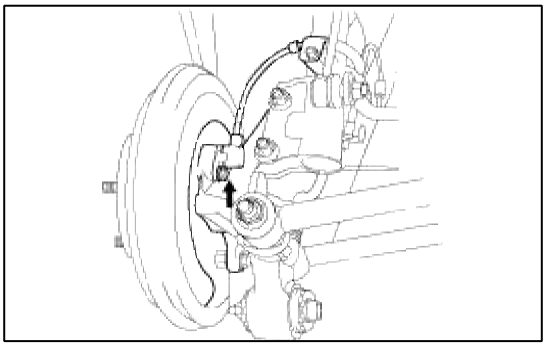


3. Remove the front wheel speed sensor after disconnecting the wheel speed sensor connector.

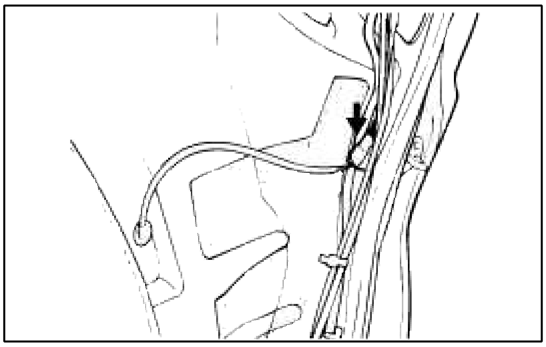


REAR WHEEL SPEED SENSOR

1. Remove the rear wheel speed sensor mounting bolt.

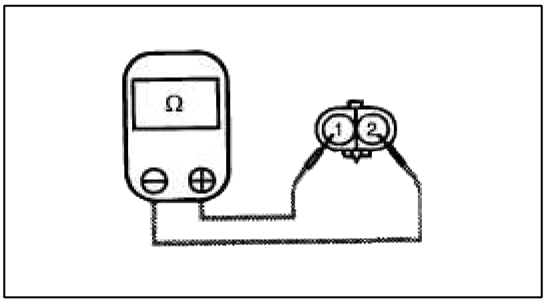


2. Remove the luggage trim and disconnect the wire connector from the rear wheel speed sensor.



INSPECTION

1. Connect an ohmmeter between the wheel speed sensor terminals and measure the resistance.

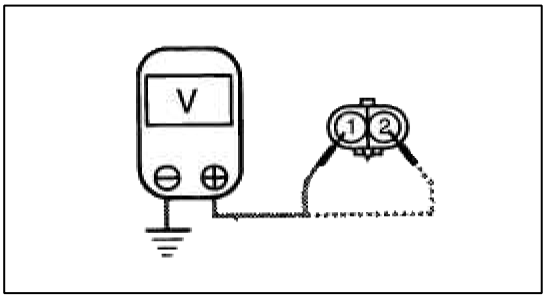


Service standard
Front, Rear: 1,385 ± 110Ω

2. Connect a voltmeter between the wheel speed sensor terminals and measure the voltage by turnong the wheel.

NOTE

Set the voltmeter to measure AC voltage.
Service standard : AC voltage detected.



Service standard
Output voltage: Min.130mVp.p

BLEEDING OF BRAKE SYSTEM

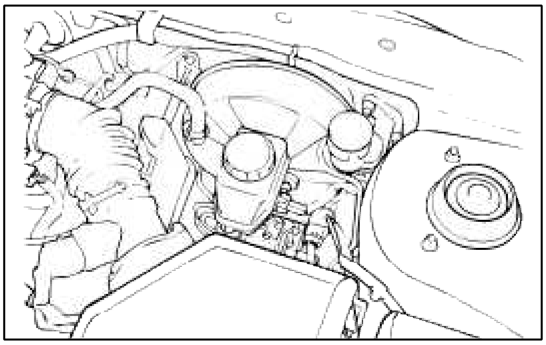
1. Remove the reservoir cap and fill the brake reservoir with brake fluid.

CAUTION

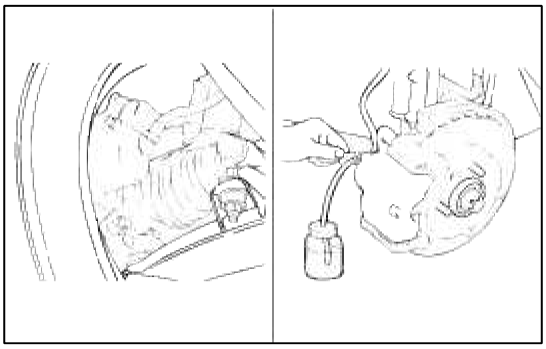
If there is any brake fluid on any painted surface, wash it off immediately.

NOTE

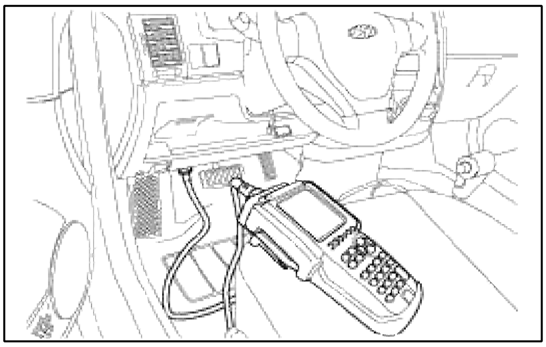
When pressure bleeding, do not depress the brake pedal.
Recommended fluid .... DOT3 or DOT4



2. Connect a clear plastic tube to the wheel cylinder bleeder plug and insert the other end of the tube into a half filled clear plastic bottle.



3. Connect the Hi-Scan (Pro) to the data link connector located underneath the dash panel.

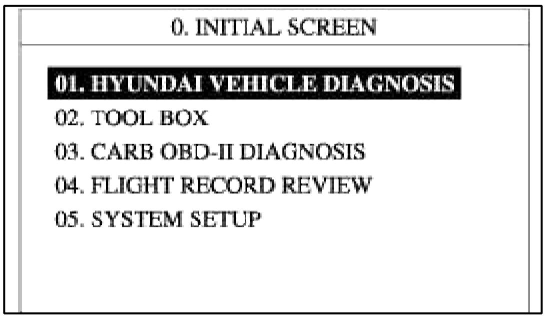


4. Select and operate according to the instructions on the Hi-Scan (Pro) screen.

CAUTION

You must obey the maximum operating time of the ABS motor with the Hi-Scan (Pro) to prevent the motor pump from burning.

(1) Select hyundai vehicle diagnosis.



0. INITIAL SCREEN

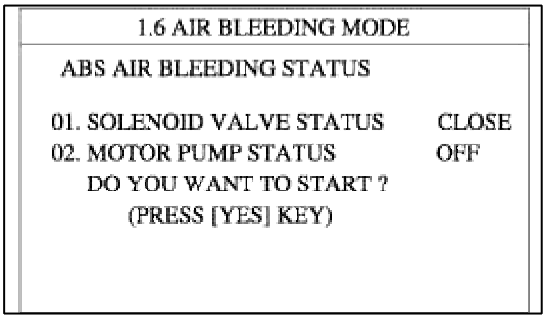
01. HYUNDAI VEHICLE DIAGNOSIS
02. TOOL BOX
03. CARB OBD-II DIAGNOSIS
04. FLIGHT RECORD REVIEW
05. SYSTEM SETUP

(2) Select vehicle name.

(3) Select Anti-Lock Brake system.

(4) Select air bleeding mode.

(5) Press ‘YES’ to operate motor pump and solenoid valve.

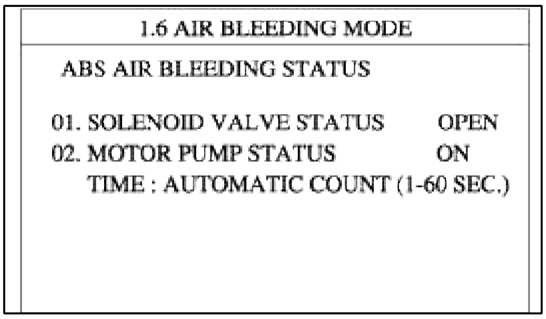


1.6 AIR BLEEDING MODE

ABS AIR BLEEDING STATUS

01. SOLENOID VALVE STATUS CLOSE
02. MOTOR PUMP STATUS OFF
DO YOU WANT TO START ?
(PRESS [YES] KEY)

(6) Wait 60 sec. before operating the air bleeding.
(If not, you may damage the motor.)



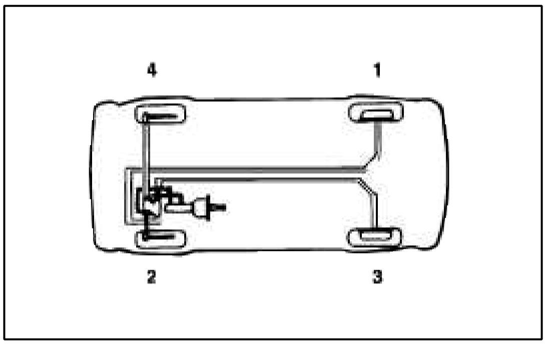
1.6 AIR BLEEDING MODE

ABS AIR BLEEDING STATUS

01. SOLENOID VALVE STATUS OPEN
02. MOTOR PUMP STATUS ON
TIME : AUTOMATIC COUNT (1-60 SEC.)

5. Pump the brake pedal several times, and then loosen the bleeder screw until fluid starts to run out without bubbles. Then close the bleeder screw.

6. Repeat step 5 until there are no more bubbles in the fluid for each wheel.



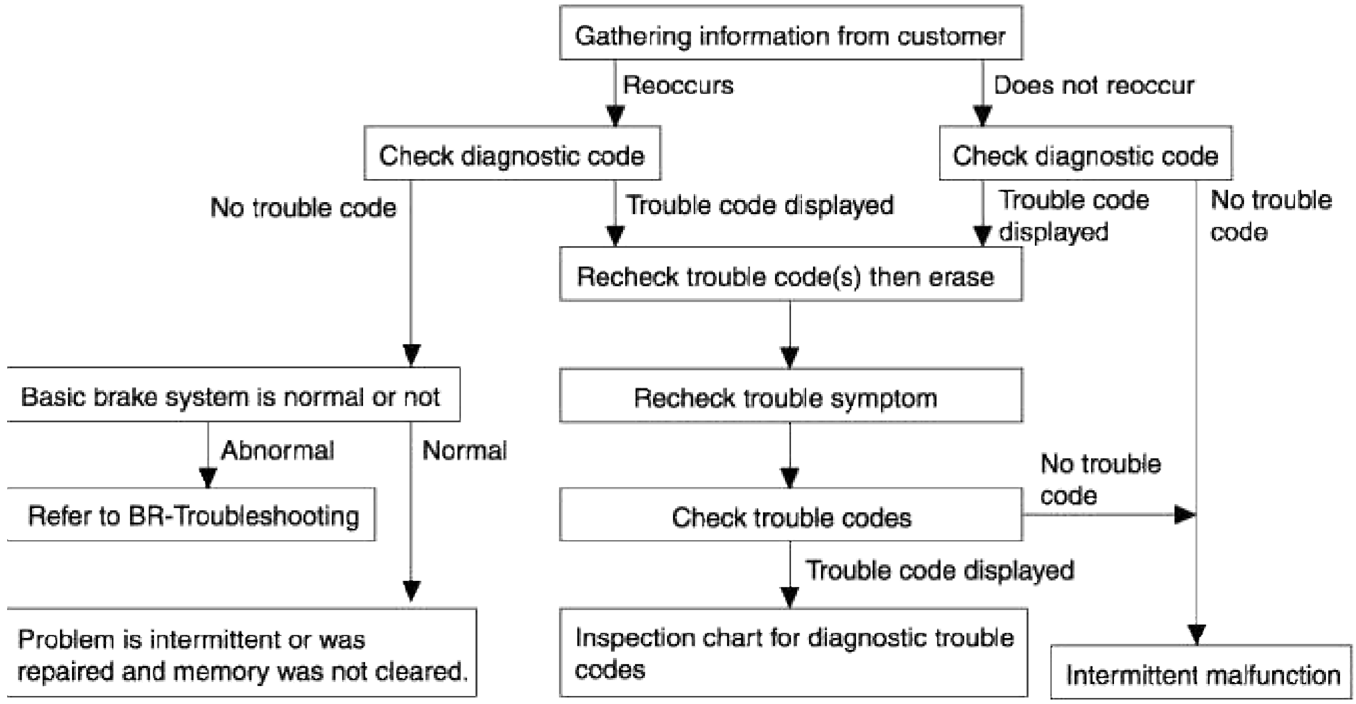
7. Tighten the bleeder screw.

Bleed screw tightening torque:
7 ~ 13 Nm (70 ~130 kg·cm, 5 ~ 9.5 lb·ft)

Brake System > ABS(Anti-Lock Brake System) > Troubleshooting

INSPECTION FOR TROUBLE SYMPTOMS

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING


Gathering information from customer
Reoccurs
Does not reoccur
Check diagnostic code
Check diagnostic code
No trouble code
Trouble code displayed
Trouble code displayed
No trouble code
Recheck trouble code(s) then erase
Basic brake system is normal or not
Recheck trouble symptom
Abnormal
Normal
No trouble code
Refer to BR-Troubleshooting
Check trouble codes
Trouble code displayed
Problem is intermittent or was repaired and memory was not cleared.
Inspection chart for diagnostic trouble codes
Intermittent malfunction

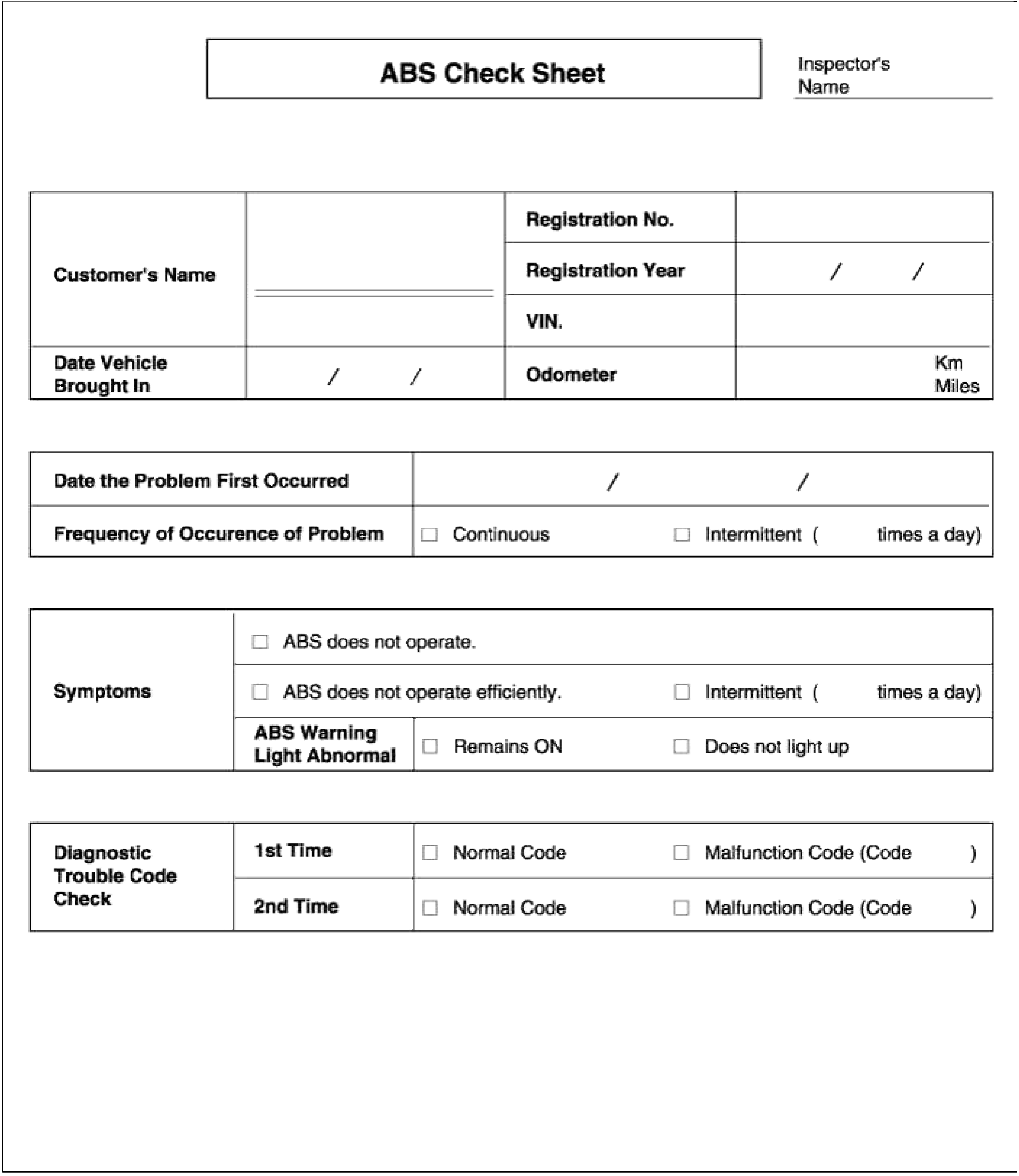
*** Using the customer problem analysis check sheet for reference, ask the customer as much detail as possible about the problem.**

NOTES WITH REGARD TO DIAGNOSIS

The phenomena listed in the following table is not abnormal.

PHENOMENON	EXPLANATION
System check sound	When starting the engine, a thudding sound can sometimes be heard coming from inside the engine compartment. This is because the system operation check is being performed.
ABS operation sound	1. Sound of the motor inside the ABS hydraulic unit operation. (whine) 2. Sound is generated along with vibration of the brake pedal. (scraping) 3. When ABS operates, sound is generated from the vehicle chassis due to repeated brake application and release. (Thump : suspension; squeak: tires)
ABS operation (Long braking distance)	For road surfaces such as snow-covered and gravel roads, the braking distance for vehicles with ABS can sometimes be longer than that for other vehicles. Accordingly, advise the customer to drive safely on such roads by lowering the vehicle speed.
Pedal kick back	Pedal kick back is normal operation.
Diagnosis detection conditions can vary depending on the diagnosis code. When checking the trouble symptom after the diagnosis code has been erased, ensure that the requirements listed in "Comment" are met.	

ABS CHECK SHEET



ABS Check Sheet

Inspector's Name ____________

Customer's Name		**Registration No.**	
		Registration Year	/ /
		VIN.	
Date Vehicle Brought In	/ /	**Odometer**	Km Miles

Date the Problem First Occurred	/ /
Frequency of Occurence of Problem	☐ Continuous ☐ Intermittent (times a day)

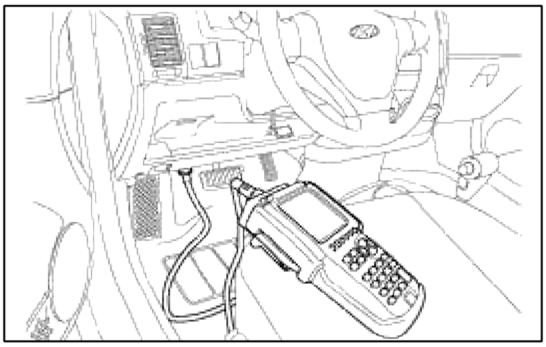
Symptoms	☐ ABS does not operate.		
	☐ ABS does not operate efficiently.		☐ Intermittent (times a day)
	ABS Warning Light Abnormal	☐ Remains ON	☐ Does not light up

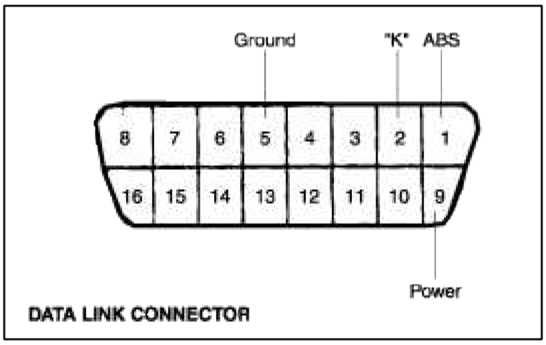
Diagnostic Trouble Code Check	**1st Time**	☐ Normal Code	☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code	☐ Malfunction Code (Code)

HI-SCAN (PRO) CHECK

1. Turn the ignition OFF.
2. Connect the Hi-Scan (Pro) to the data link connector located underneath the lower crash pad panel.
3. Turn the ignition ON.
4. Use the Hi-Scan (Pro) to check for diagnostic trouble codes.
5. After completion of the repair or correction of the problem, erase the stored fault codes using the clear key on the Hi-Scan (Pro).

6. Disconnect the Hi-Scan (Pro).





INSPECTION CHART FOR TROUBLE SYMPTOMS

TROUBLE SYMPTOMS		INSPECTION PROCEDURE NO.
Communication with Hi-Scan (Pro) is not possible.	Communication with any system is not possible.	1
	Communication with ABS only is not possible.	2
When the ignition key is turned to "ON" (engine OFF), the ABS warning lamp does not illuminate.		3
After the engine starts, the lamp remains illuminated.		4
Faulty ABS operation.	Unequal braking power on both sides.	5
	Insufficient braking power.	
	ABS operates under normal braking conditions.	
	ABS operates before vehicle stops under normal braking conditions.	
	Large brake pedal vibration. (See Caution)	

CAUTION

During ABS operation, the brake pedal may vibrate or may not be able to be depressed. Such phenomena are due to intermittent changes in hydraulic pressure inside the brake line to prevent the wheels from locking and is not an abnormality

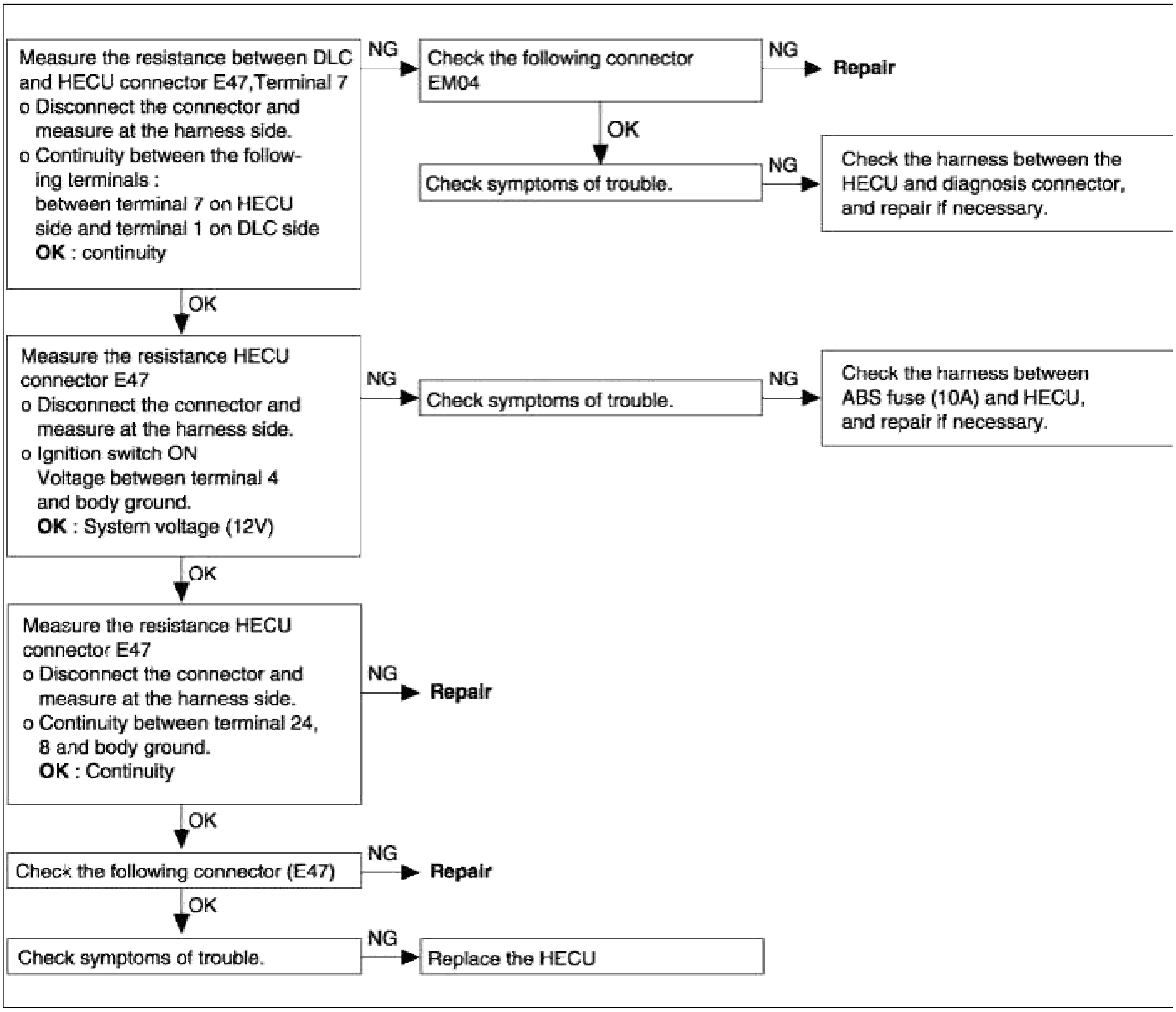
INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

INSPECTION PROCEDURE 1

Communication with Hi-Scan (Pro) is not possible. (Communication with all systems is not possible.)	Probable cause
Possible defect in the power supply system (including ground) for the diagnosis line.	• Malfunction of connector. • Malfunction of wiring harness.

INSPECTION PROCEDURE 2

Communication with Hi-Scan (Pro) is not possible. (Communication with ABS only is not possible.)	Probable cause
When communication with Hi-Scan (Pro) is not possible, the cause may be probably an open circuit in the HECU power circuit or an open circuit in the diagnosis output circuit.	• Blown fuse. • Malfunction of wiring harness or connector. • Malfunction of HECU.



Measure the resistance between DLC and HECU connector E47,Terminal 7
o Disconnect the connector and measure at the harness side.
o Continuity between the following terminals :
between terminal 7 on HECU side and terminal 1 on DLC side
OK : continuity

Check the following connector EM04

Repair

Check symptoms of trouble.

Check the harness between the HECU and diagnosis connector, and repair if necessary.

Measure the resistance HECU connector E47
o Disconnect the connector and measure at the harness side.
o Ignition switch ON
Voltage between terminal 4 and body ground.
OK : System voltage (12V)

Check symptoms of trouble.

Check the harness between ABS fuse (10A) and HECU, and repair if necessary.

Measure the resistance HECU connector E47
o Disconnect the connector and measure at the harness side.
o Continuity between terminal 24, 8 and body ground.
OK : Continuity

Repair

Check the following connector (E47)

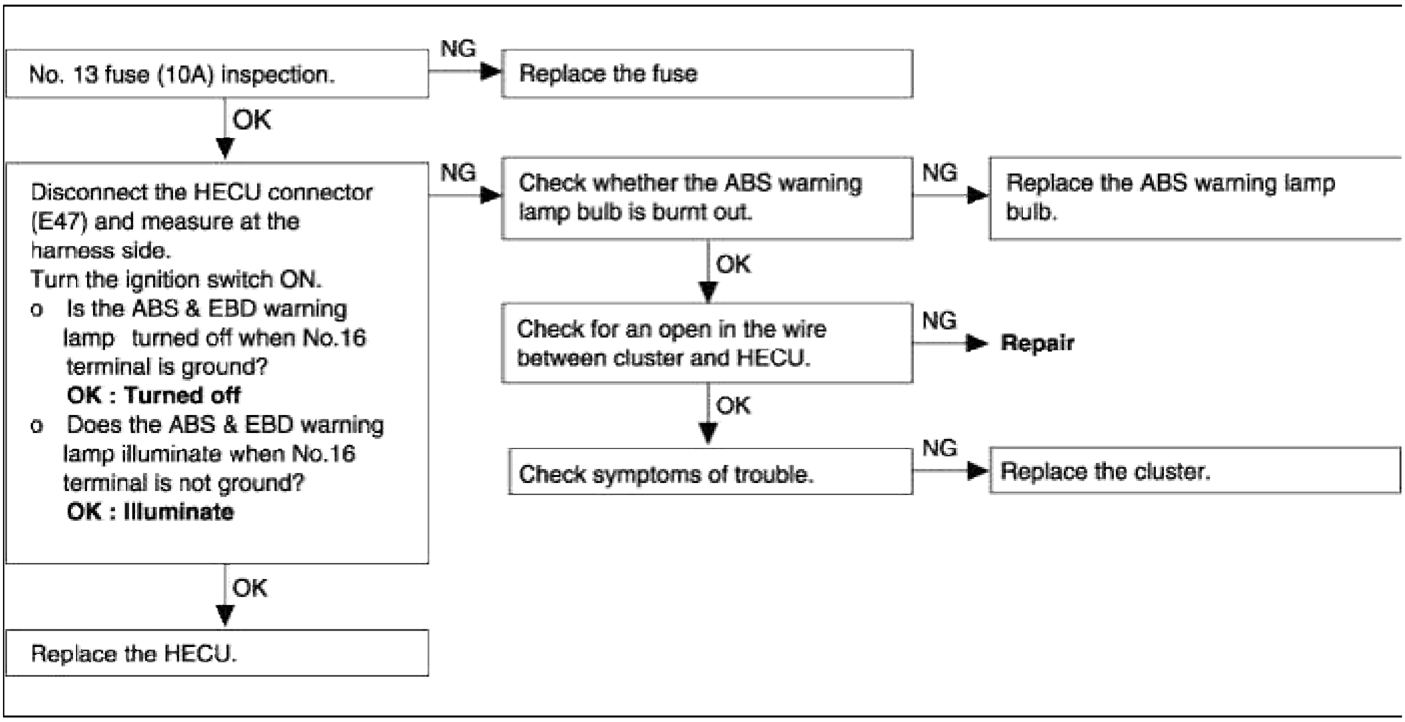
Repair

Check symptoms of trouble.

Replace the HECU

INSPECTION PROCEDURE 3

When ignition key is turned "ON" (engine OFF), the ABS warning lamp does not illuminate.	Probable cause
When current flows in the HECU, the ABS warning lamp turns from on to off as the initial check. Therefore, if the lamp does not illuminate, the cause may be an open circuit in the lamp power supply circuit, a blown bulb, an open circuit in both the circuits between the ABS warning lamp and the HECU, and the malfunction of HECU.	• Blown fuse. • Burnt out ABS warning lamp bulb. • Malfunction of wiring harness or connector. • Malfunction of active warning lamp module. • Malfunction of HECU.

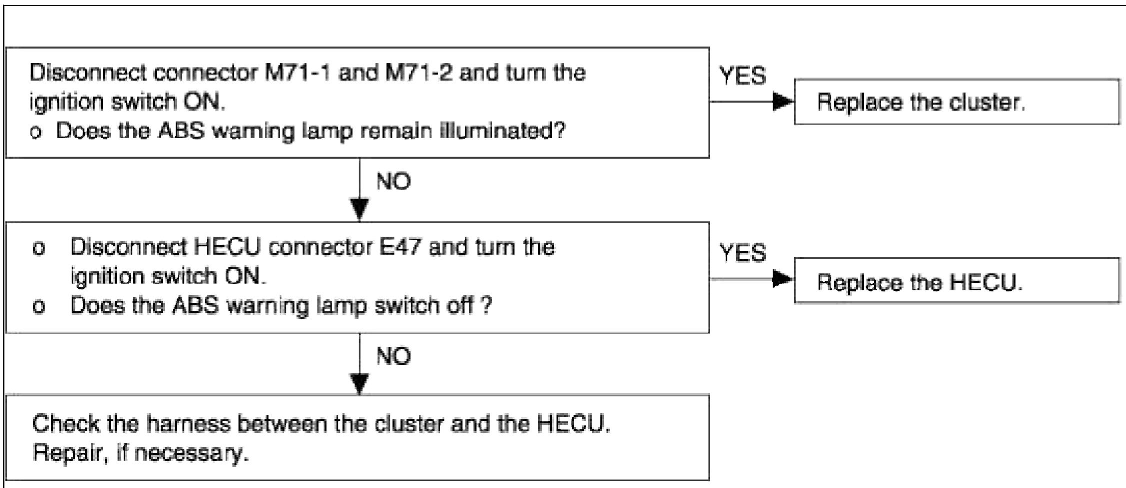

No. 13 fuse (10A) inspection.
NG
Replace the fuse
OK
Disconnect the HECU connector (E47) and measure at the harness side.
Turn the ignition switch ON.
o Is the ABS & EBD warning lamp turned off when No.16 terminal is ground?
OK : Turned off
o Does the ABS & EBD warning lamp illuminate when No.16 terminal is not ground?
OK : Illuminate
NG
Check whether the ABS warning lamp bulb is burnt out.
NG
Replace the ABS warning lamp bulb.
OK
Check for an open in the wire between cluster and HECU.
NG
Repair
OK
Check symptoms of trouble.
NG
Replace the cluster.
OK
Replace the HECU.

INSPECTION PROCEDURE 4

Even after the engine is started, the ABS warning lamp remains illuminated.	Probable cause
A possible short-circuit in the ABS warning lamp illumination circuit.	• Malfunction of cluster. • Malfunction of HECU. • Malfunction of wiring harness.

NOTE

This trouble symptom is limited to cases where communication with the Hi-Scan (Pro) is possible (HECU power supply is normal) and DTC is normal.



Disconnect connector M71-1 and M71-2 and turn the ignition switch ON.
o Does the ABS warning lamp remain illuminated?

YES → Replace the cluster.

NO

o Disconnect HECU connector E47 and turn the ignition switch ON.
o Does the ABS warning lamp switch off ?

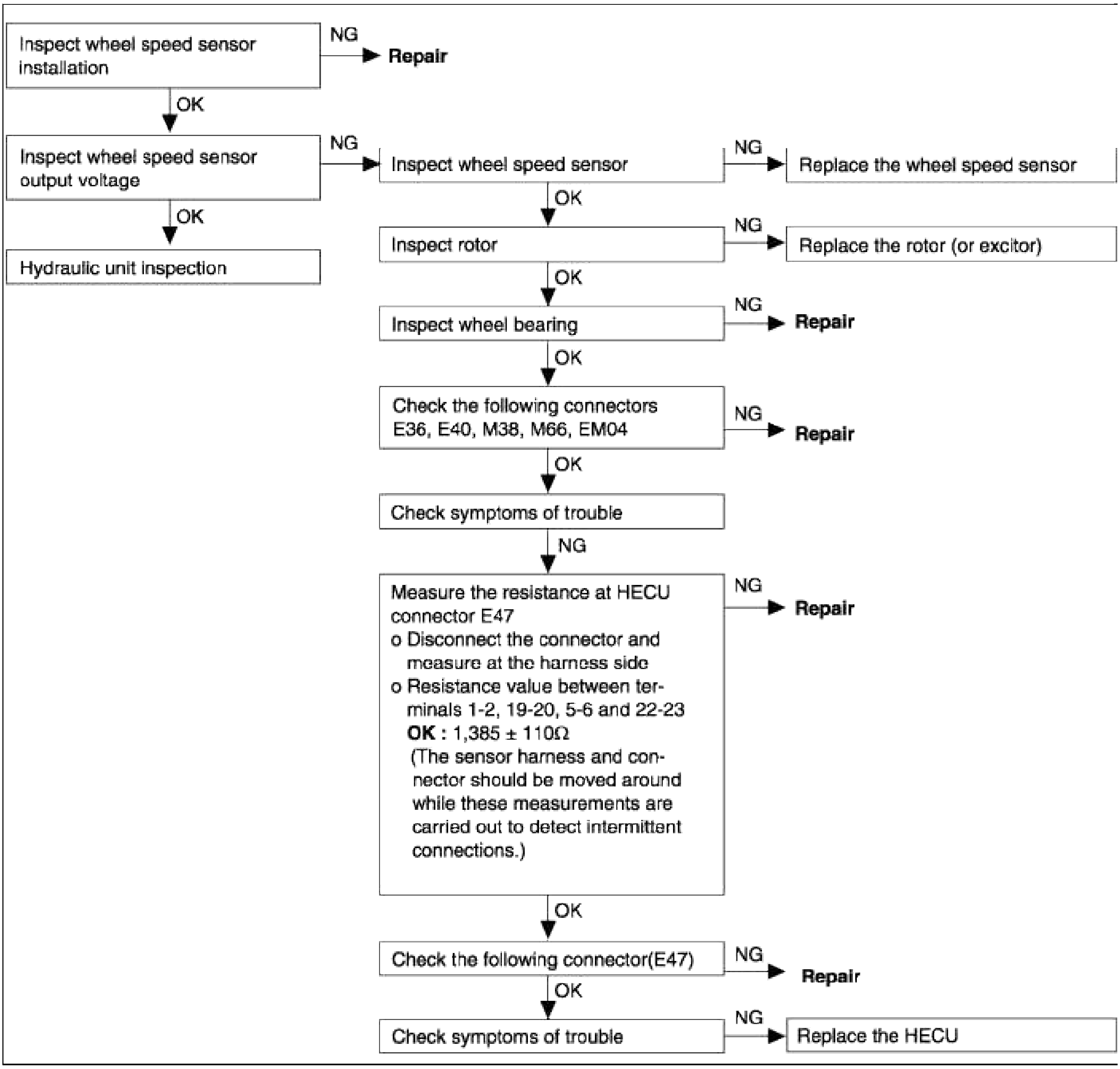
YES → Replace the HECU.

NO

Check the harness between the cluster and the HECU. Repair, if necessary.

INSPECTION PROCEDURE 5

Brake operation is abnormal.	Probable cause	
Brake operation varies depending on driving conditions and road surface conditions, so diagnosis can be difficult. However, if a normal DTC is displayed, carry out the following inspection.	• Improper installation of wheel speed sensor • Incorrect sensor harness contact. • Foreign material on wheel speed sensor.	• Malfunction of wheel speed sensor. • Malfunction of rotor. • Malfunction of wheel bearing. • Malfunction of HECU.


Inspect wheel speed sensor installation
NG
Repair
OK
Inspect wheel speed sensor output voltage
NG
Inspect wheel speed sensor
NG
Replace the wheel speed sensor
OK
Hydraulic unit inspection
OK
Inspect rotor
NG
Replace the rotor (or excitor)
OK
Inspect wheel bearing
NG
Repair
OK
Check the following connectors E36, E40, M38, M66, EM04
NG
Repair
OK
Check symptoms of trouble
NG
Measure the resistance at HECU connector E47
o Disconnect the connector and measure at the harness side
o Resistance value between terminals 1-2, 19-20, 5-6 and 22-23
OK : 1,385 ± 110Ω
(The sensor harness and connector should be moved around while these measurements are carried out to detect intermittent connections.)
NG
Repair
OK
Check the following connector(E47)
NG
Repair
OK
Check symptoms of trouble
NG
Replace the HECU

INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES

DTC	Trouble Location	Remarks
C1101	Battery voltage over volt : 18V or more	
C1102	Battery voltage low volt : 9.5V or less	
C1200	FL wheel sensor : open or short to ground	
C1201	- Range/Performance : speed jump or damaged exciter	
C1202	- No signal : air-gap error or wrong exciter	
C1203	FR wheel sensor : open or short to ground	
C1204	- Range/Performance : speed jump or damaged exciter	
C1205	- No signal : air-gap error or wrong exciter	
C1206	RL wheel sensor : open or short to ground	
C1207	- Range/Performance : speed jump or damaged exciter	
C1208	- No signal : air-gap error or wrong exciter	
C1209	RR wheel sensor : open or short to ground	
C1210	- Range/Performance : speed jump or damaged exciter	
C1211	- No signal : air-gap error or wrong exciter	
C1604	ECU hardware : ECU internal or valve failure	
C2112	Valve relay : valve relay or fuse failure	
C2402	Motor-Electrical : open or short to battery, motor relay, fuse or motor lock fail	

ACTUATOR DRIVING

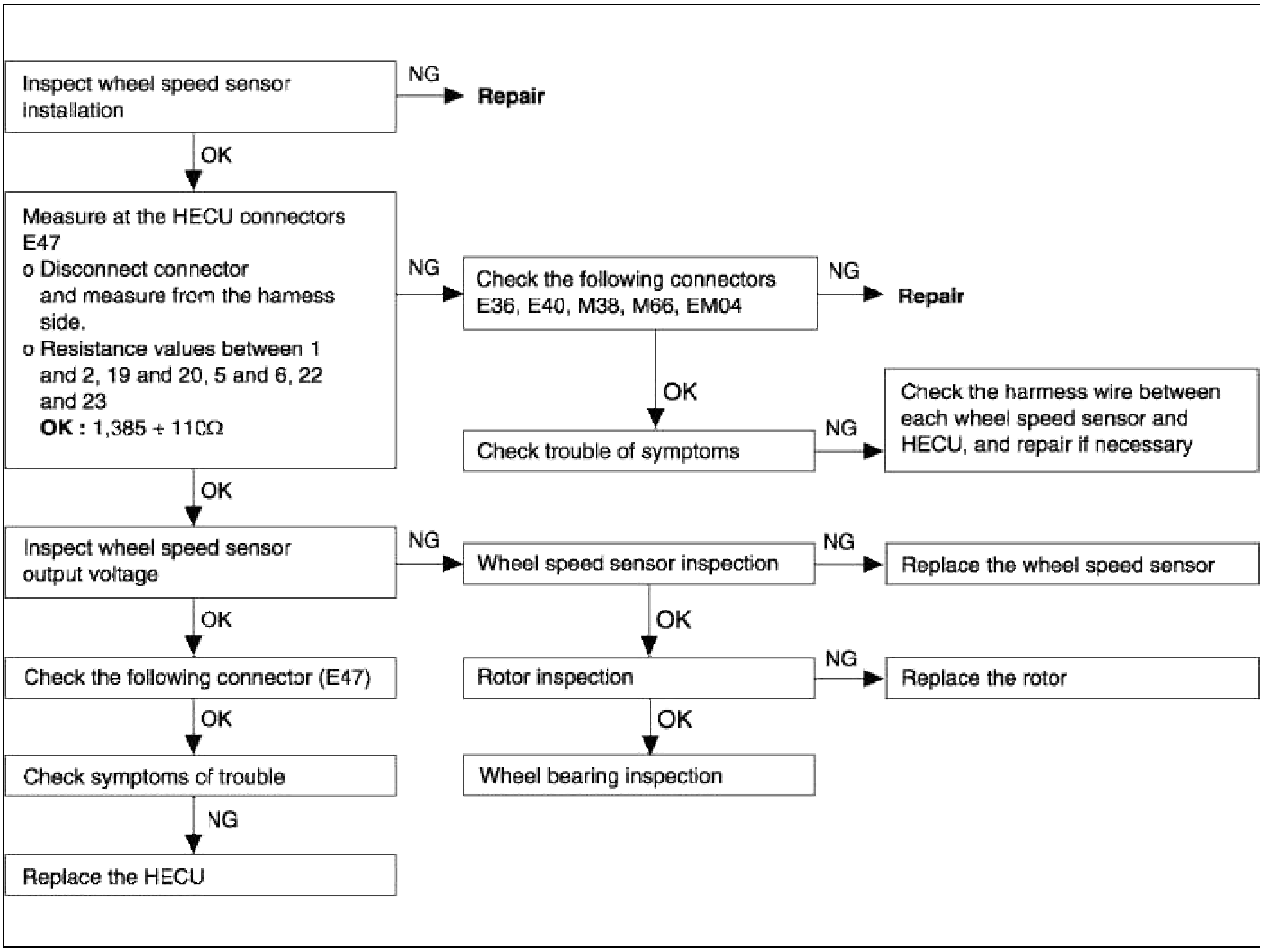
NO.	Description	Condition	Recognition	Time
01	Motor	KEY ON ENG. OFF	Motor pump relay operation (Click sounds)	2 seconds
02	Front left valve (In)		Front left solenoid valve operation (Click sounds)	
03	Front right valve (In)		Front right solenoid valve operation (Click sounds)	
04	Rear left valve (In)		Rear left solenoid valve operation (Click sounds)	
05	Rear right valve (In)		Rear right solenoid valve operation (Click sounds)	
06	Front left valve (Out)		Front left solenoid valve operation (Click sounds)	
07	Front right valve (Out)		Front right solenoid valve operation (Click sounds)	
08	Rear left valve (Out)		Rear left solenoid valve operation (Click sounds)	
09	Rear right valve (Out)		Rear right solenoid valve operation (Click sounds)	

CURRENT DATA

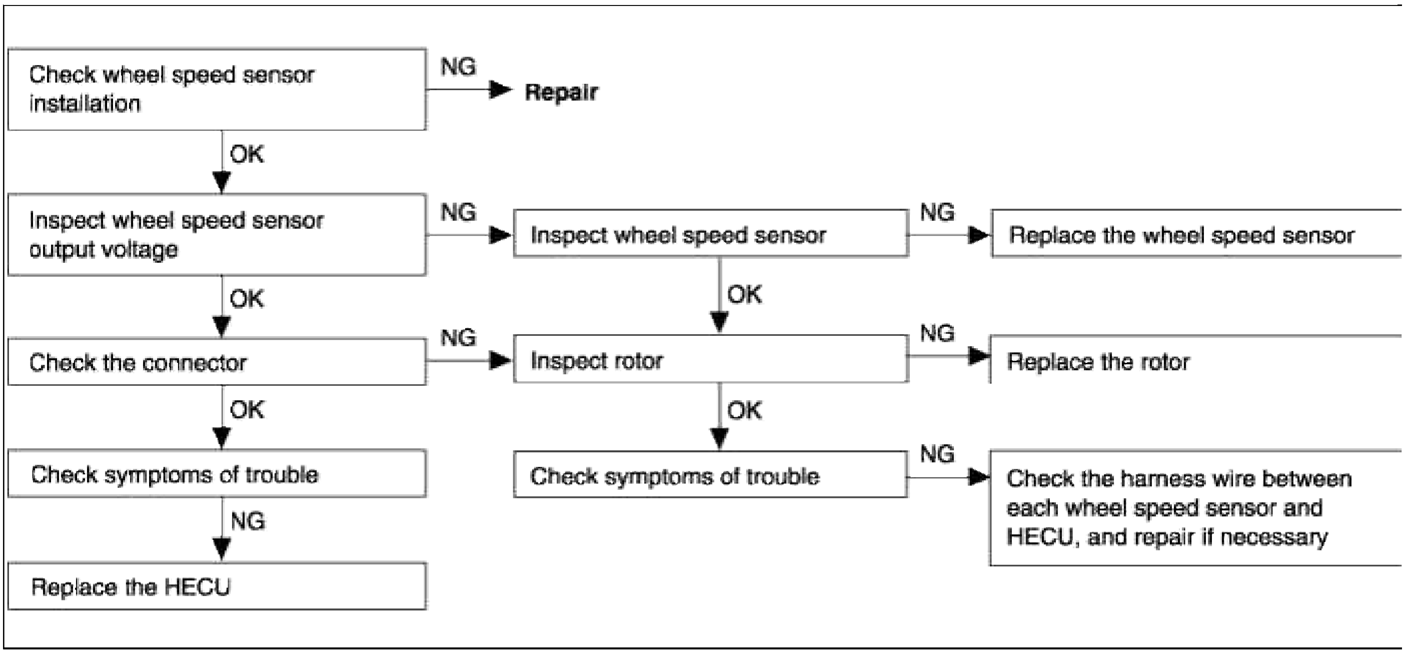
NO.	Description	Recognition	Unit
1	Battery	Battery	Voltage
2	FL wheel speed SNSR	Front left wheel speed sensor	km/h
3	FR wheel speed SNSR	Front right wheel speed sensor	
4	RL wheel speed SNSR	Rear left wheel speed sensor	
5	RR wheel speed SNSR	Rear right wheel speed sensor	
6	ABS SRI status	Warning lamp	ON/OFF
7	Brake SW	Brake switch	
8	Motor pump relay	Motor relay	
9	Valve relay	Valve relay	
10	Motor pump status	Motor	
11	FL valve (In)	Front left valve (In)	
12	FR valve (In)	Front right valve (In)	
13	RL valve (In)	Rear left valve (In)	
14	RR valve (In)	Rear right valve (In)	
15	FL valve (Out)	Front left valve (Out)	
16	FR valve (Out)	Front right valve (Out)	
17	RL valve (Out)	Rear left valve (Out)	
18	RR valve (Out)	Rear right valve (Out)	

INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES

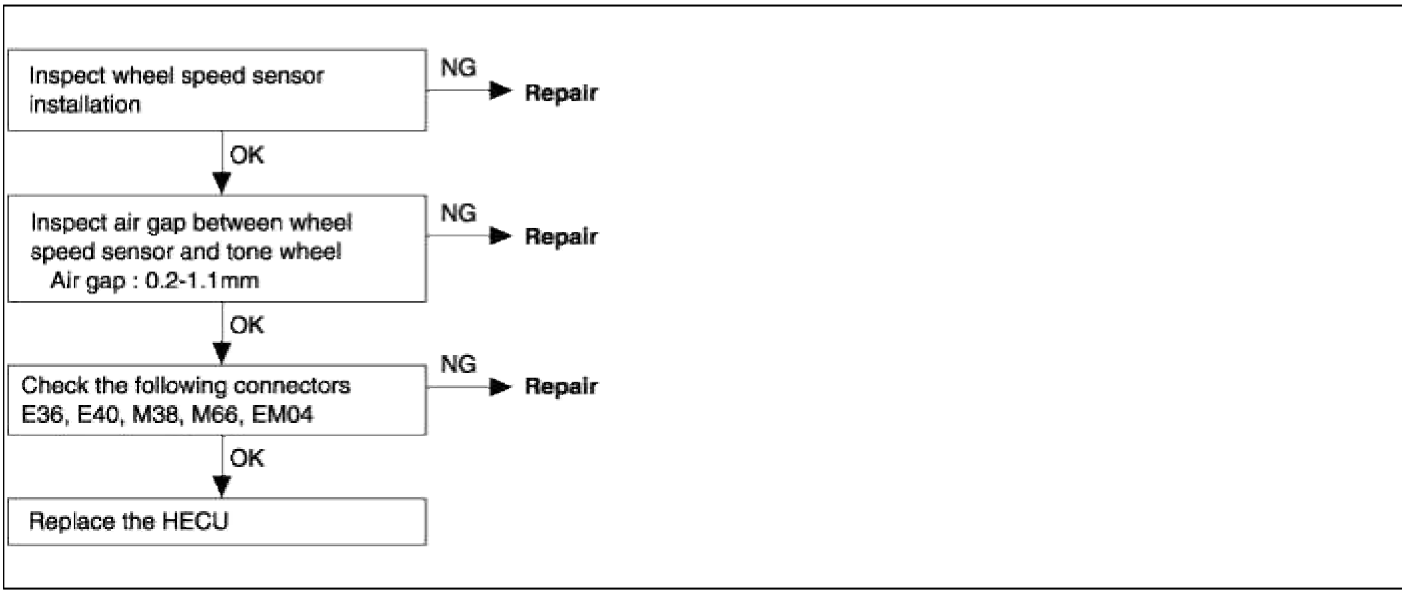
DTC No. C1200, C1203, C1206, C1209 Wheel speed sensor open or short to GND circuit	Probable cause
The HECU determines that an open or short circuit has occurred in more than one wire of a wheel speed sensor.	• Malfunction of wheel speed sensor • Malfunction of wiring harness or connector • Malfunction of HECU


Inspect wheel speed sensor installation
NG
Repair
OK
Measure at the HECU connectors E47
o Disconnect connector and measure from the harness side.
o Resistance values between 1 and 2, 19 and 20, 5 and 6, 22 and 23
OK : 1,385 ± 110Ω
NG
Check the following connectors E36, E40, M38, M66, EM04
NG
Repair
OK
Check trouble of symptoms
NG
Check the harmess wire between each wheel speed sensor and HECU, and repair if necessary
OK
Inspect wheel speed sensor output voltage
NG
Wheel speed sensor inspection
NG
Replace the wheel speed sensor
OK
Check the following connector (E47)
OK
Rotor inspection
NG
Replace the rotor
OK
Check symptoms of trouble
OK
Wheel bearing inspection
NG
Replace the HECU

DTC No C1201, C1204, C1207, C1210 Wheel speed sensor signal error	Probable cause
Abnormal output signal from a wheel speed sensor other than an open or short circuit.	• Improper installation of wheel speed sensor. • Malfunction of wheel speed sensor. • Malfunction of rotor • Malfunction of wheel bearing. • Malfunction of siring harness or connector. • Malfunction of HECU.


Check wheel speed sensor installation
NG
Repair
OK
Inspect wheel speed sensor output voltage
NG
Inspect wheel speed sensor
NG
Replace the wheel speed sensor
OK
OK
Check the connector
NG
Inspect rotor
NG
Replace the rotor
OK
OK
Check symptoms of trouble
Check symptoms of trouble
NG
Check the harness wire between each wheel speed sensor and HECU, and repair if necessary
NG
Replace the HECU

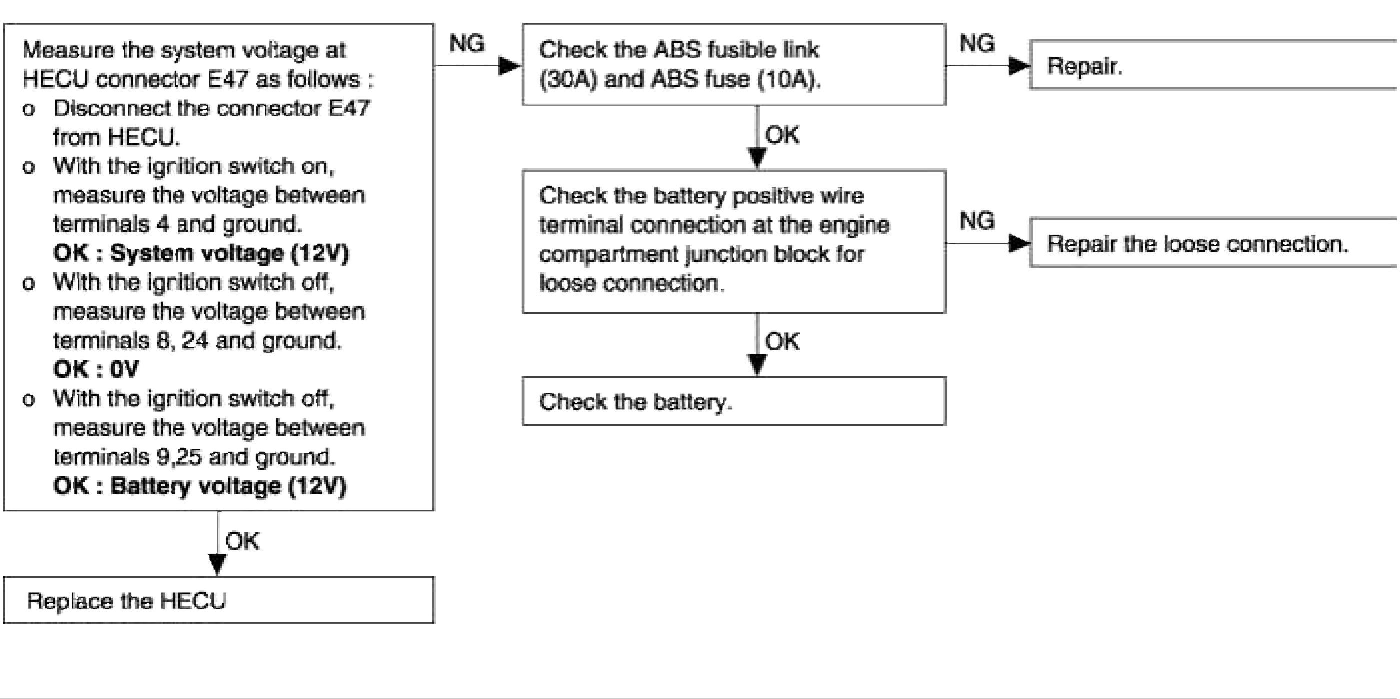
DTC No. C1202, C1205, C1208, C1211 (Large air gap)	Probable cause
No wheel speed sensor output signal.	• Malfunction of wheel speed sensor • Improper installation of wheel speed sensor • Malfunction of rotor (excitor) • Malfunction of wiring harness or connector • Malfunction of HECU


Inspect wheel speed sensor installation
NG
Repair
OK
Inspect air gap between wheel speed sensor and tone wheel
Air gap : 0.2-1.1mm
NG
Repair
OK
Check the following connectors E36, E40, M38, M66, EM04
NG
Repair
OK
Replace the HECU

DTC No. C1101, C1102 Voltage out of range. (Over and under voltage)	Probable cause
The voltage of the HECU power supply drops lower than or rises higher than the specified value. If the voltage returns to the specified value, this code is no longer output.	• Malfunction of wiring harness or connector. • Malfunction of HECU • Blown ABS fuse.

CAUTION

If battery voltage drops or rises during inspection, this code will be output as well. If the voltage returns to the standard value, the code is no longer output. Before carrying out the following inspection, check the battery level, and refill if necessary.


Measure the system voltage at HECU connector E47 as follows :
- Disconnect the connector E47 from HECU.
- With the ignition switch on, measure the voltage between terminals 4 and ground.
  OK : System voltage (12V)
- With the ignition switch off, measure the voltage between terminals 8, 24 and ground.
  OK : 0V
- With the ignition switch off, measure the voltage between terminals 9,25 and ground.
  OK : Battery voltage (12V)

Replace the HECU

Check the ABS fusible link (30A) and ABS fuse (10A).

Repair.

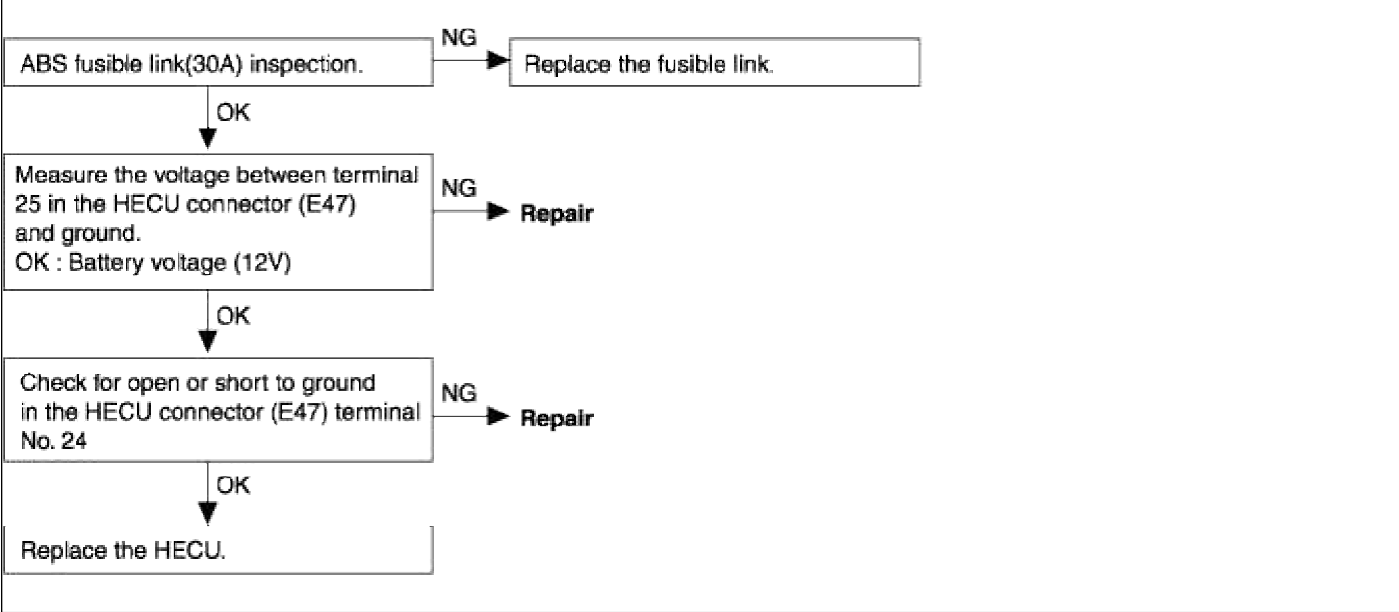
Check the battery positive wire terminal connection at the engine compartment junction block for loose connection.

Repair the loose connection.

Check the battery.

DTC No. C1604 HECU Hardware. HECU hardware error. (EEPROM and ECU failure)	Probable cause
The HECU always monitors the solenoid valve drive circuit. It determines that there is an open or short-circuit in the solenoid coil or in a harness even if no current flows in the solenoid or through the HECU.	• Malfunction of wiring harness or connector. • Malfunction of HECU.

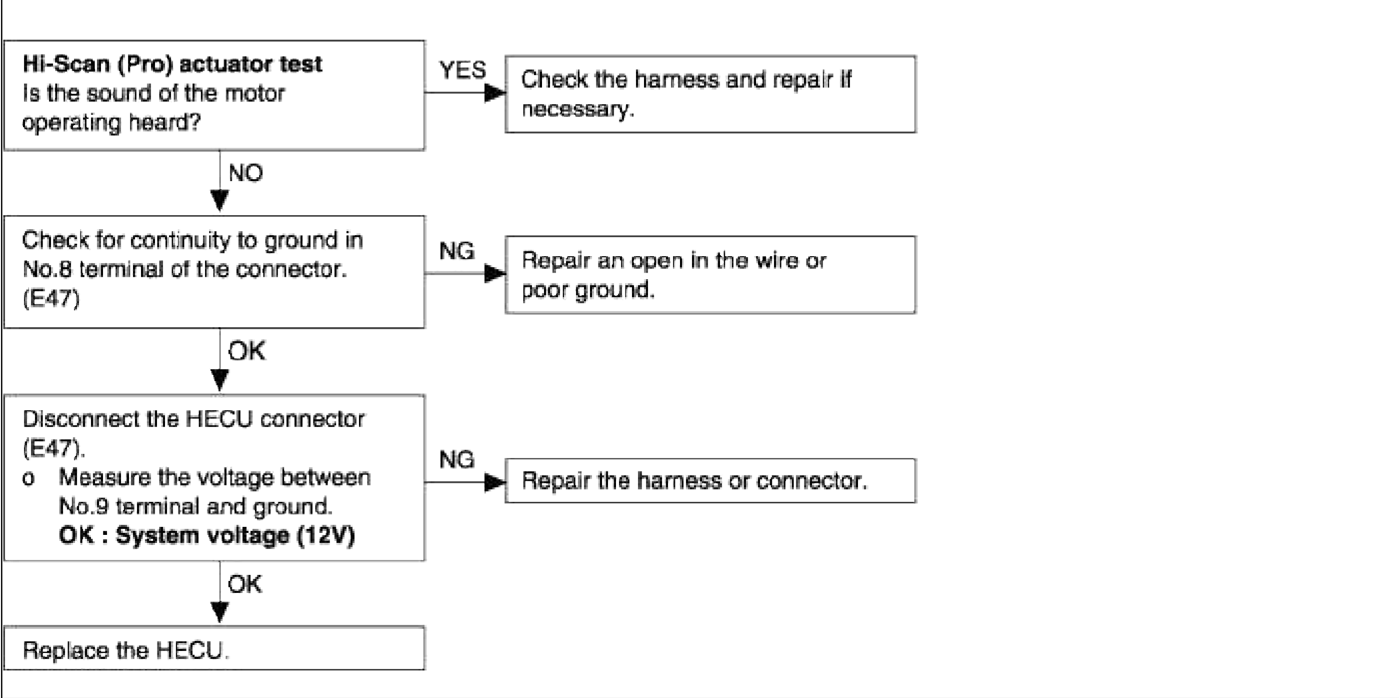
DTC No. C2112 Valve relay error. (Including fuse failure)	Probable cause
When the ignition switch is turned ON, the HECU switches the valve relay on and off during its initial check. During this time, voltage sent to the valve relay is compared to the voltage in the valve power monitor line. If no current is detected in the valve power monitor line, the HECU determines that there is an open circuit and DTC C2112 is recorded.	• Malfunction of wiring harness or connector. • Malfunction of HECU. • Malfunction of valve relay • Poor ground.


ABS fusible link(30A) inspection.
NG
Replace the fusible link.
OK
Measure the voltage between terminal 25 in the HECU connector (E47) and ground.
OK : Battery voltage (12V)
NG
Repair
OK
Check for open or short to ground in the HECU connector (E47) terminal No. 24
NG
Repair
OK
Replace the HECU.

DTC No. C2402 Motor pump error.	Probable cause
When the motor power line is normal but no signal is in detected in the motor monitor line.	• Malfunction of wiring harness or connector. • Malfunction of HECU. • Poor ground.

CAUTION

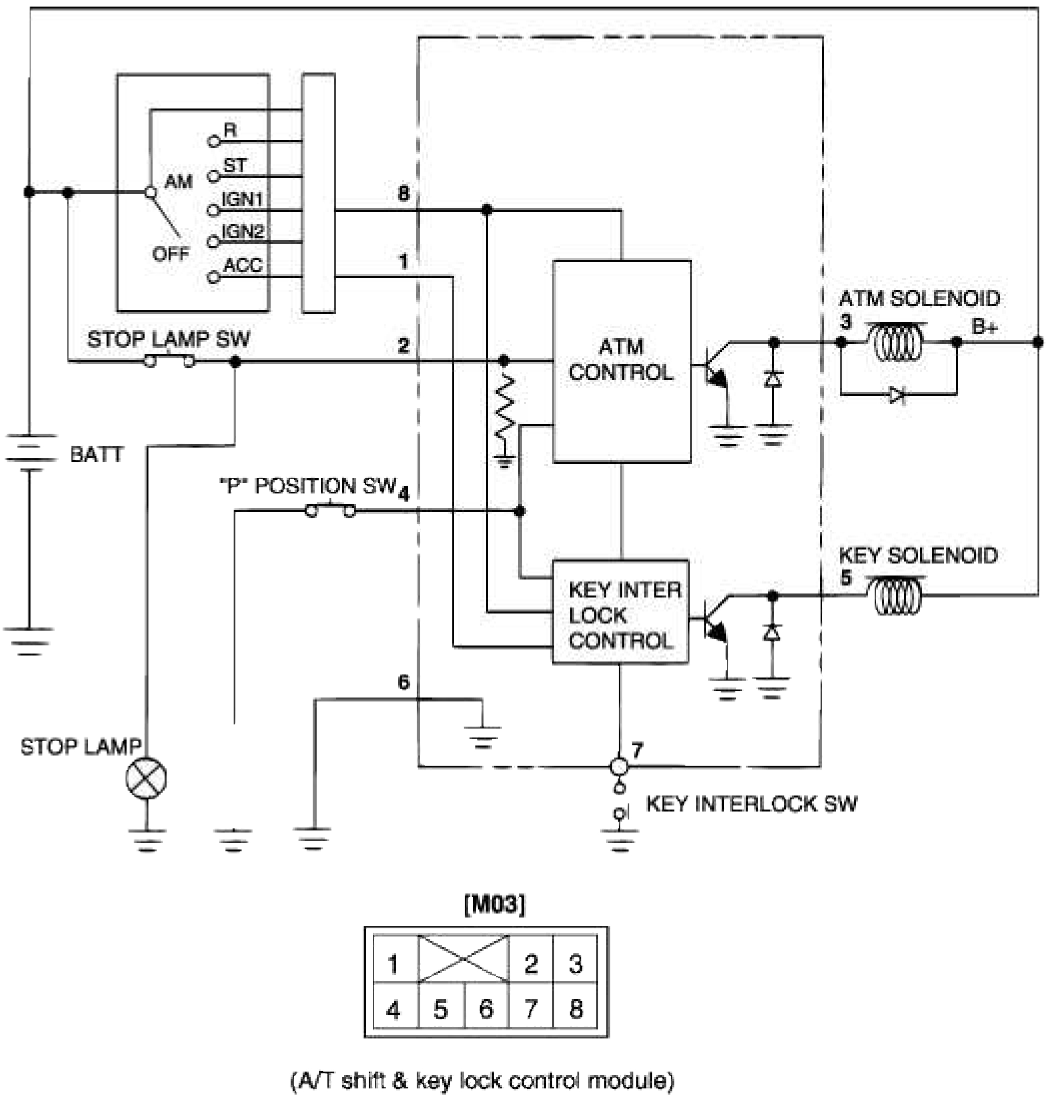
Powering the motor with the Hi-Scan(Pro) will discharge the battery. Start and run the engine for a while after testing is complete.


Hi-Scan (Pro) actuator test
Is the sound of the motor operating heard?
YES
Check the harness and repair if necessary.
NO
Check for continuity to ground in No.8 terminal of the connector. (E47)
NG
Repair an open in the wire or poor ground.
OK
Disconnect the HECU connector (E47).
o Measure the voltage between No.9 terminal and ground.
OK : System voltage (12V)
NG
Repair the harness or connector.
OK
Replace the HECU.

ACCENT(LC) > 2002 > G 1.5 SOHC > Clutch System

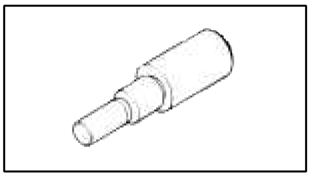
Clutch System > General Information > Schematic Diagrams

CIRCUIT DIAGRAM


R
ST
AM
IGN1
IGN2
OFF
ACC
8
1
STOP LAMP SW
2
BATT
"P" POSITION SW
4
ATM CONTROL
ATM SOLENOID
3
B+
KEY SOLENOID
5
KEY INTER LOCK CONTROL
6
STOP LAMP
7
KEY INTERLOCK SW
[M03]
1
2
3
4
5
6
7
8
(A/T shift & key lock control module)

Clutch System > General Information > Special Service Tools

SPECIAL TOOLS

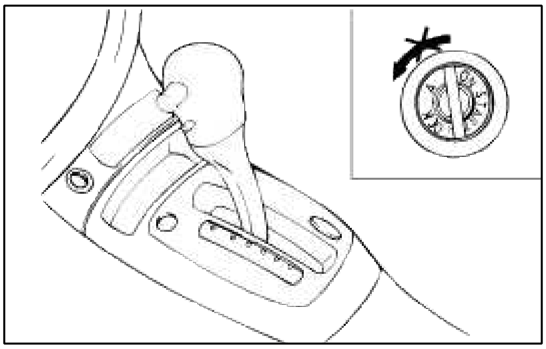
Tool (Number and name)	Illustration	Use
09411-25000 Clutch disc guide		Installation of the clutch disc

Clutch System > General Information > Description and Operation

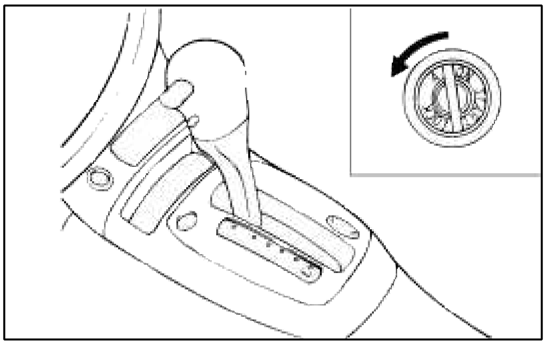
SYSTEM CHECK

KEY LOCK SYSTEM

1. Check that the ignition key cannot be turned to "LOCK (OFF)" position, when the position of the shift lever is not in "P" position.

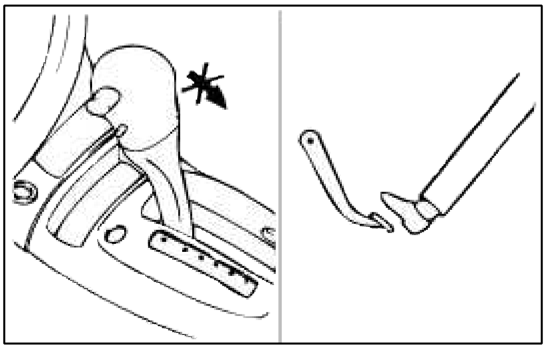


2. Check that the ignition key turns to the "LOCK (OFF)" position, when the shift lever is set to the "P" position.

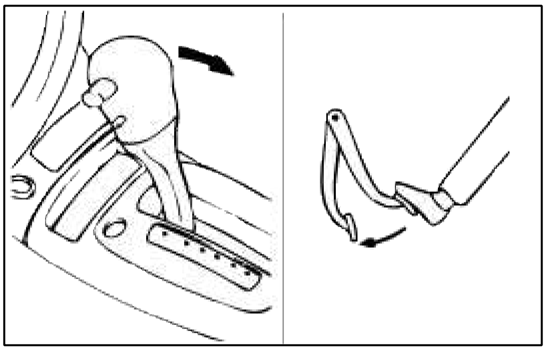


SHIFT LOCK SYSTEM

1. Check that under the following conditions, the shift lever cannot be movedfrom the "P" position to any other position.
   IGNITION KEY POSITION : "ON"
   BRAKE PEDAL : NOT DEPRESSED
   BUTTON : PRESSED

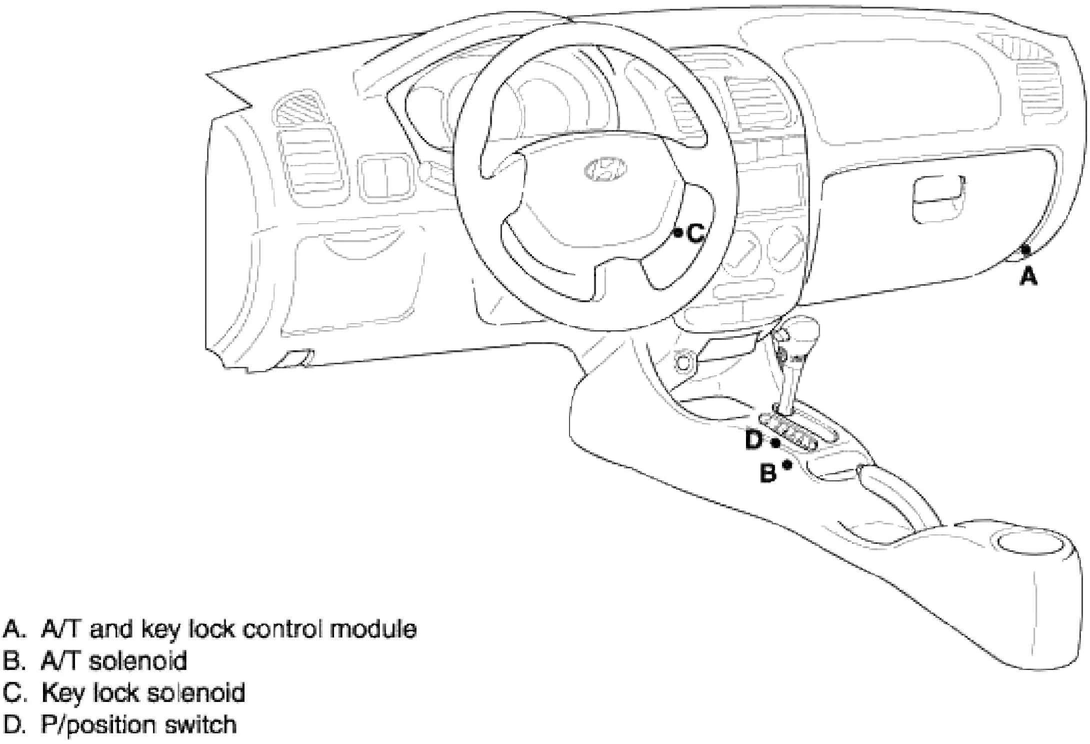


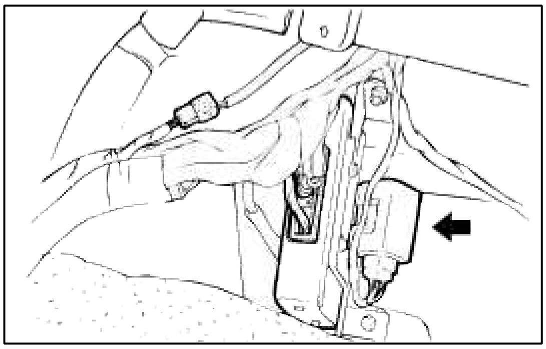
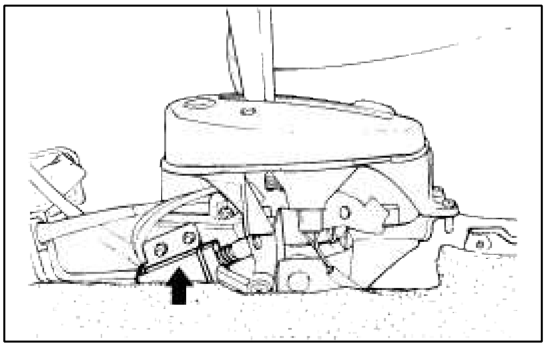
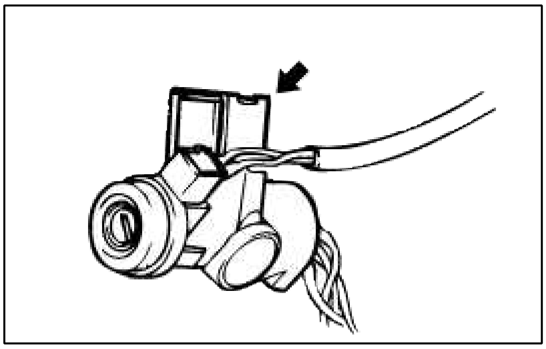
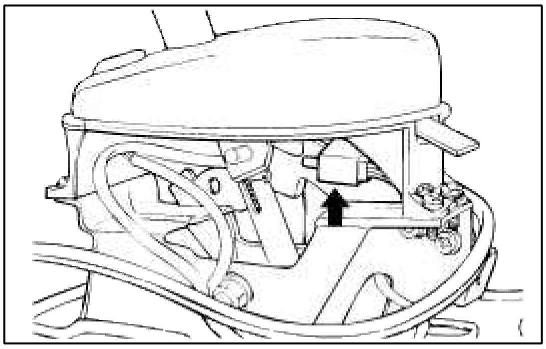
2. Check that under the following conditions, the shift lever can be moved fromthe "P" position to other position.
   IGNITION KEY POSITION : "ON"
   BRAKE PEDAL : DEPRESSED
   BUTTON : PRESSED



Clutch System > General Information > Components and Components Location

COMPONENTS


C
A
D
B
A. A/T and key lock control module
B. A/T solenoid
C. Key lock solenoid
D. P/position switch

A. A/T and key lock control module	B. A/T solenoid
	
C. Key lock solenoid	D. P/position switch
	

Clutch System > General Information > Troubleshooting

TROUBLESHOOTING

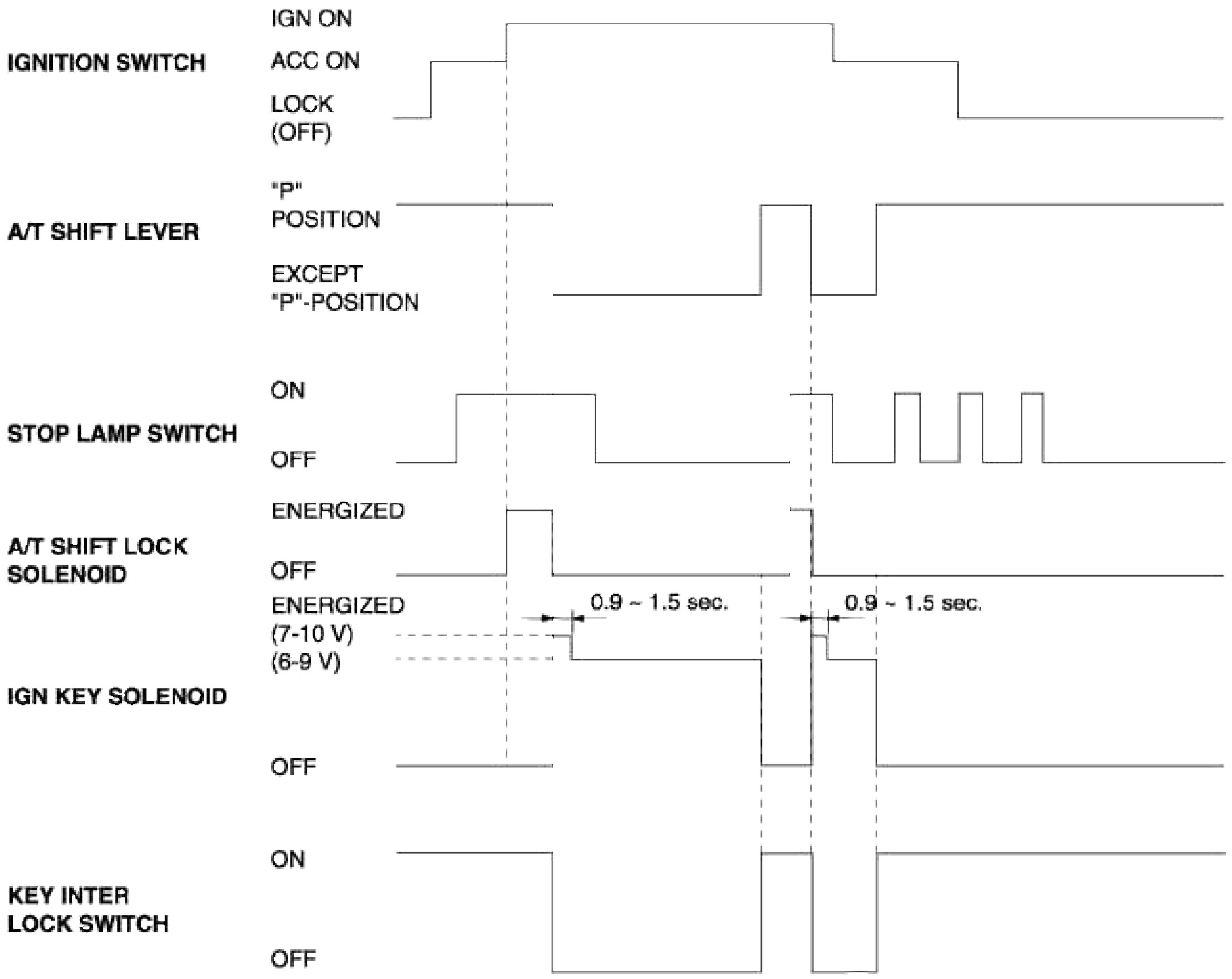
Symptom		Probable cause	Remedy
Clutch slipping • Car will not respond to engine speed during acceleration • Insufficient vehicle speed • Lack of power during uphill driving		Insufficient clutch pedal free play Clogged hydraulic system Excessive wear of clutch disc facing Hardened clutch disc facing, or oil on surface Damaged pressure plate or flywheel Weak or broken pressure spring	Adjust Correct or replace parts Replace Replace Replace Replace
Difficult gear shifting (gear noise during shifting)		Excessive pedal free play Hydraulic system fluid leaks, air trapping or clogging Unusual wear or corrosion of clutch disc spline Excessive vibration (distortion) of clutch disc	Adjust Repair or replace parts Replace Replace
Clutch noisy	When clutch is not used	Insufficient play of clutch pedal	Adjust
		Excessive wear of clutch disc facing	Replace
	A noise is heard after clutch is disengaged	Unusual wear and/or damage of release bearing	Replace
	A noise is heard when clutch is disengaged	Insuffcient grease on the sliding surface of bearing sleeve	Repair
		Improperly installed clutch assembly or bearing	Repair
	A noise is heard when car is suddenly rolled with clutch partially engaged	Damaged pilot bushing	Replace
Difficult to depress clutch pedal		Insufficient lubrication of clutch pedal Insufficient lubrication of the clutch disc spline Insufficient lubrication of the clutch release lever shaft Insufficient lubrication of front bearing retainer	Repair Repair Repair Repair
Difficult to shift gear or cannot shift at all		Excessive clutch pedal free play excessive Clutch release cylinder faulty Clutch disc out of true, runout is excessive or lining broken Spline on input shaft or clutch disc dirty or burred Clutch pressure plate faulty	Adjust pedal free play Repair release cylinder Inspect clutch disc Repair as necessary Replace clutch cover
Clutch slips		Clutch pedal free play insufficient Clogged hydraulic system Clutch disc lining oily or worn out Pressure plate faulty Release fork binding	Adjust pedal free play Repair or replace parts Inspect clutch disc Replace clutch cover Inspect release fork
Clutch grabs/chatters		Clutch disc lining oily or worn out Pressure plate faulty Clutch diaphragm spring bent	Inspect clutch disc Replace clutch cover Replace clutch cover

	Worn or broken torsion spring Engine mounts loose	Replace clutch disc Repair as necessary
Clutch noisy	Damaged clutch pedal bushing Loose part inside housing Release bearing worn or dirty Release fork or linkage sticks	Replace clutch pedal bushing Repair as necessary Replace release bearing Repair as necessary

Clutch System > General Information > Repair procedures

INSPECTION

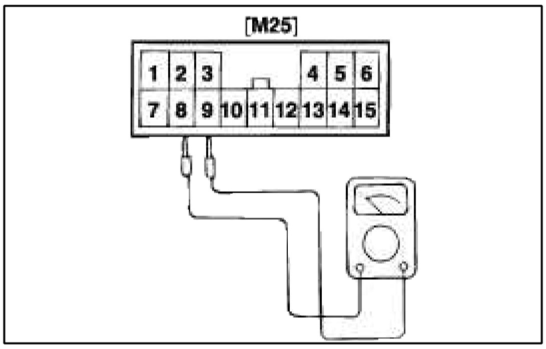
TIMMING CHART


IGNITION SWITCH
IGN ON
ACC ON
LOCK (OFF)
A/T SHIFT LEVER
"P" POSITION
EXCEPT "P"-POSITION
STOP LAMP SWITCH
ON
OFF
A/T SHIFT LOCK SOLENOID
ENERGIZED
OFF
ENERGIZED (7-10 V) (6-9 V)
0.9 ~ 1.5 sec.
0.9 ~ 1.5 sec.
IGN KEY SOLENOID
OFF
KEY INTER LOCK SWITCH
ON
OFF

A/T SHIFT LOCK SOLENOID

1. Remove the solenoid connector.

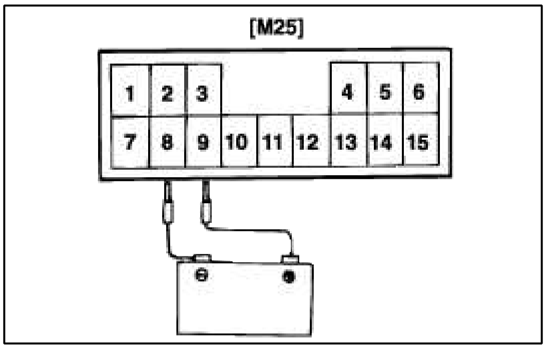
2. Using an ohmmeter, measure the resistance between terminals.


[M25]
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

Standard resistance : 12-16Ω

---

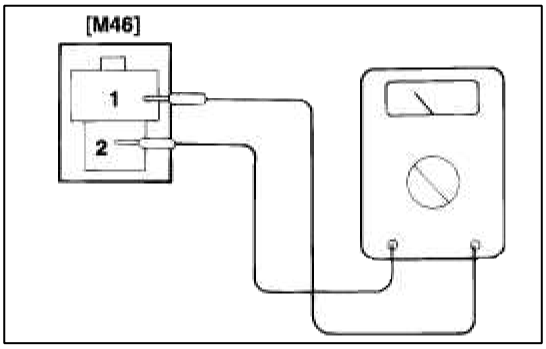
3. Attach the positive (+) lead from the battery to terminal #9. and the negative (-) lead to terminal #8.


[M25]
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

4. Check that an operation noise can be heard from the solenoid.

A/T KEY INTERLOCK SOLENOID

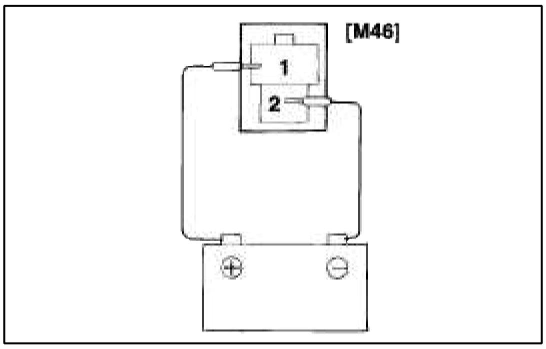
1. Remove the solenoid connector.
2. Using an ohmmeter, measure the resistance between terminals.



Standard resistance : 12-16Ω

---

3. Attach the positive (+) lead from the battery to terminal #2. and the negative (-) lead to terminal #1.



4. Check that an operation noise can be heard from the solenoid.

Clutch System > General Information > Specifications

GENERAL

SPECIFICATIONS

Item	Specifications
Clutch operating method	Hydraulic type
Clutch disc Type Facing diameter (Outside x Inside) mm	Single dry with diaphragm. 1.3SOHC, 1.5Diesel : 184 x 127.5 1.5SOHC, 1.5DOHC : 200 x 130 1.6DOHC : 215 x 145
Clutch cover assembly Type	Diaphragm spring strap
Clutch release cylinder I.D. mm (in.)	20.64 (0.81)
Clutch master cylinder I.D. mm (in.)	15.57 (0.62)

I.D. : Inside Diameter

SERVICE STANDARD

Item	Standard value
Clutch disc thickness [When free]	1.3SOHC, 1.5Diesel ; 8.4 ± 0.3 mm 1.5SOHC, 1.5 DOHC, 1.6DOHC ; 8.5 ± 0.3 mm
Clutch pedal free play	6 ~ 13 (0.24 ~ 0.52)
Clutch pedal height	166.7 (6.6)
Clutch pedal stroke	145 (5.6)

TIGHTENING TORQUE

Item	Nm	kg·cm	lb·ft
Clutch pedal to pedal support member	19 ~ 28	180 ~ 280	13 ~ 20
Clutch pedal support member to master cylinder	8 ~ 10	80 ~ 100	6 ~ 7
Clutch tube flare nut	13 ~ 17	130 ~ 170	9 ~ 13
Clutch tube bracket	4 ~ 6	40 ~ 60	3 ~ 4
Clutch release cylinder mounting bolt	15 ~ 22	150 ~ 220	11 ~ 16
Clutch release cylinder union bolt	25	250	18
Clutch cover assembly	15 ~ 22	150 ~ 220	11 ~ 16
Clutch master cylinder push rod nut	9 ~ 14	90 ~ 140	6 ~ 10
Ignition lock nut	8 ~ 10	80 ~ 100	6 ~ 7
Master cylinder reservior band	5 ~ 7	50 ~ 70	3 ~ 5

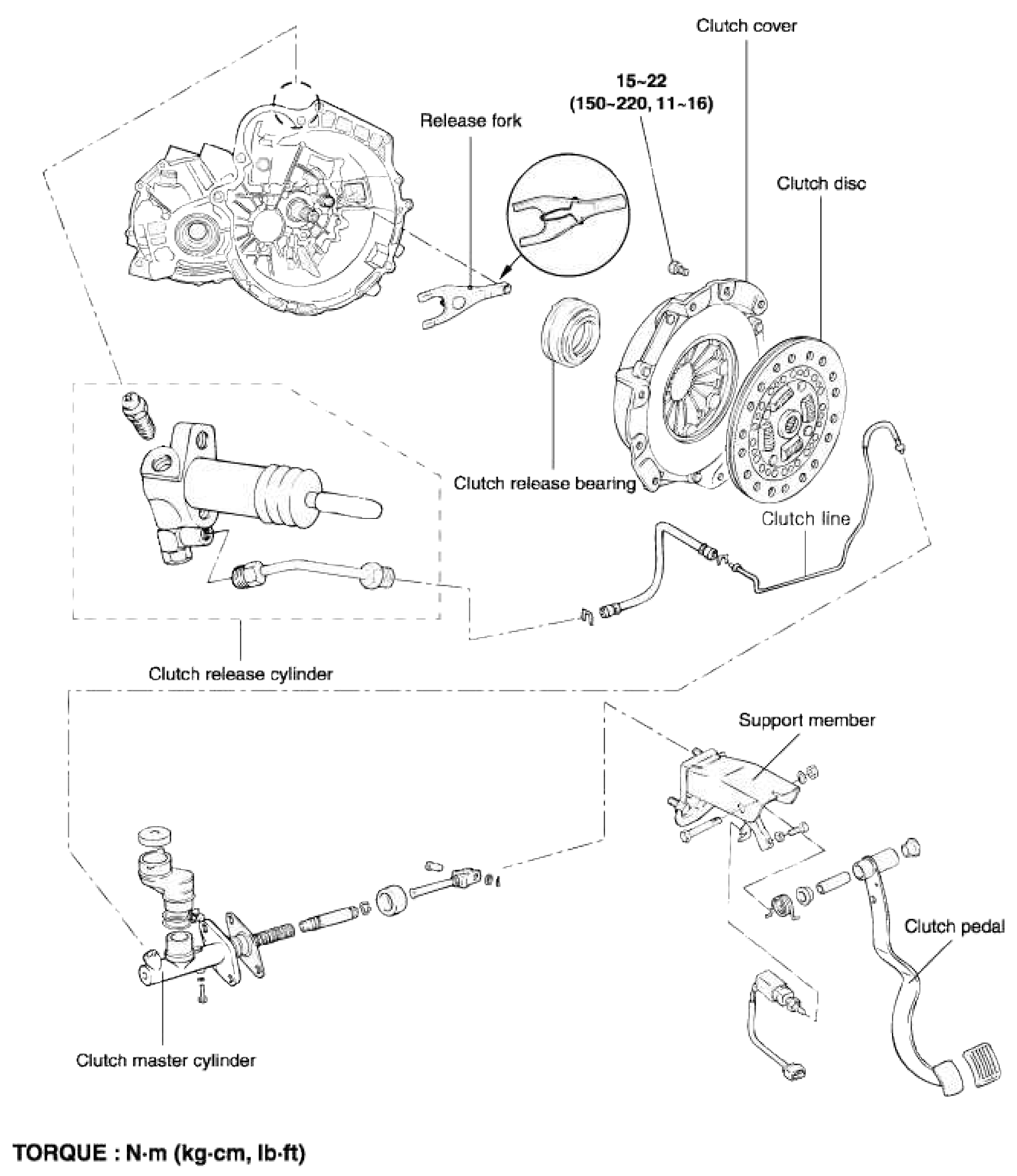
LUBRICANTS

Items	Specified lubricants	Quantity
Contact surface of release bearing and fulcrum of clutch release fork	CASMOLY L9508	As required
Inner surface of clutch release bearing	CASMOLY L9508	As required
Inner surface of clutch release cylinder and outer circumference of piston and cup	Brake fluid DOT3 or DOT4	As required
Inner surface of clutch disc spline	CASMOLY L9508	As required
Inner surface of clutch master cylinder and outer circumference of piston assembly	Brake fluid DOT3 or DOT4	As required
Clutch master cylinder push rod, clevis pin and washer	Wheel bearing grease SAE J310a, NLGI No.2	As required
Clutch pedal shaft and bushings	SAE J310a, Chassis grease, NLGI-No.1	As required
Contact portion of release fork to release cylinder push rod	CASMOLY L9508	As required

Clutch System > Clutch System > Components and Components Location

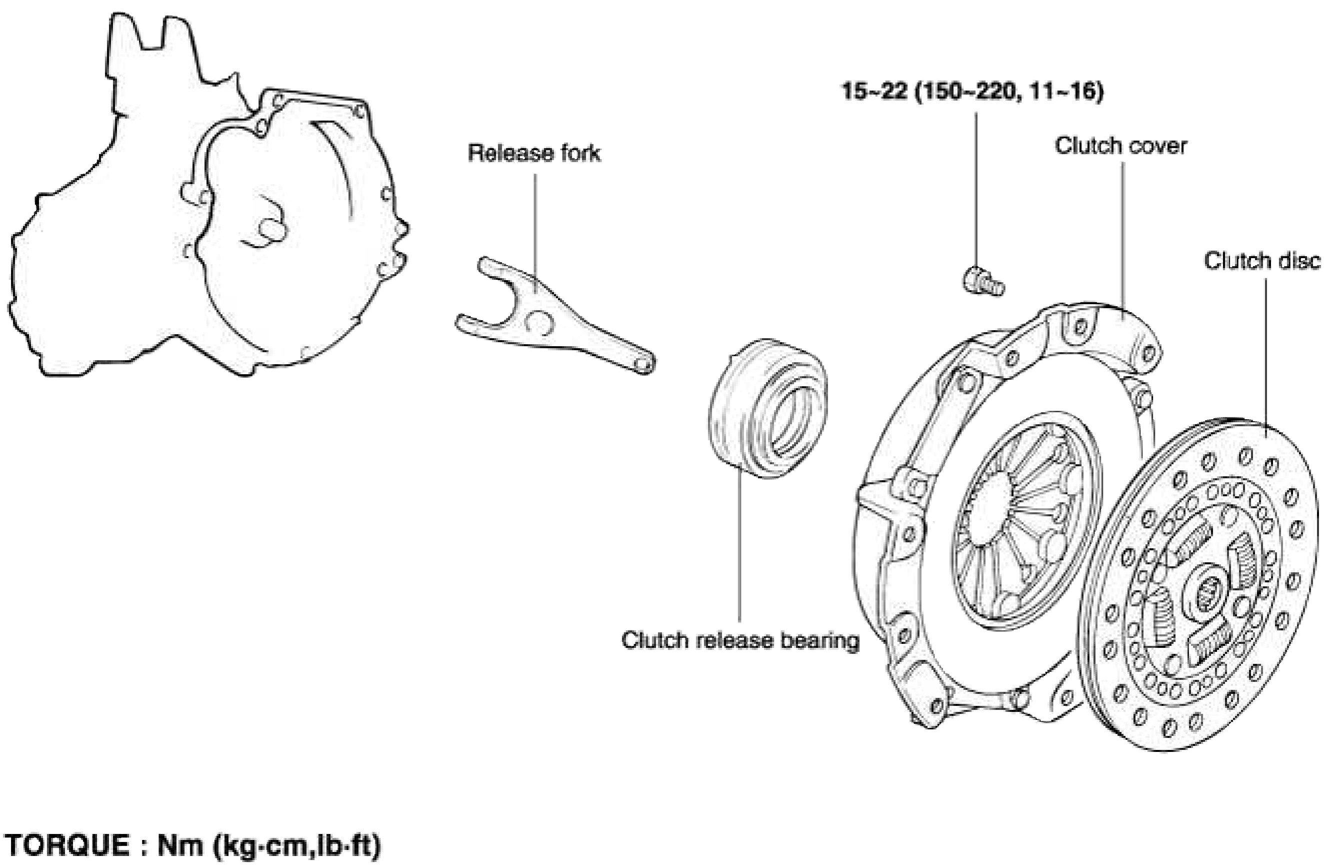
CLUTCH CONTROL

COMPONENTS


Clutch cover
15~22
(150~220, 11~16)
Release fork
Clutch disc
Clutch release bearing
Clutch line
Clutch release cylinder
Support member
Clutch pedal
Clutch master cylinder
TORQUE : N·m (kg-cm, lb·ft)

Clutch System > Clutch System > Clutch Cover And Dinode > Components and Components Location

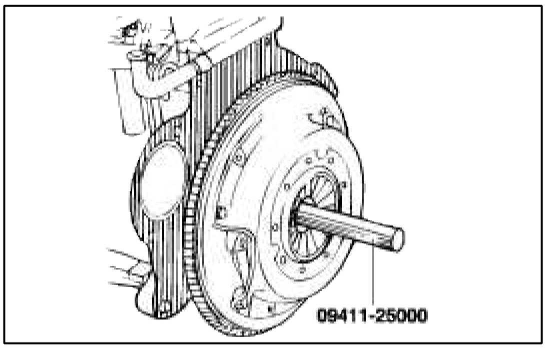
COMPONENTS


15~22 (150~220, 11~16)
Release fork
Clutch cover
Clutch disc
Clutch release bearing
TORQUE : Nm (kg·cm,lb·ft)

Clutch System > Clutch System > Clutch Cover And Dinode > Repair procedures

REMOVAL

1. Drain the clutch fluid and transaxle gear oil.
2. Remove the transaxle assembly. (Refer to the "TR" group)
3. Insert the special tool (09411-25000) in the clutch disc to prevent the disc from falling.

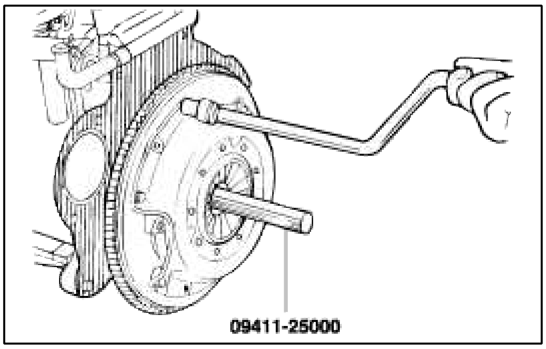

09411-25000

4. Loosen the bolts that attach the clutch cover to the flywheel in a star pattern.

5. Loosen the bolts in succession, one or two turns at a time, to avoid bending the cover flange.

CAUTION

DO NOT clean the clutch disc or release bearing with cleaning solvent.



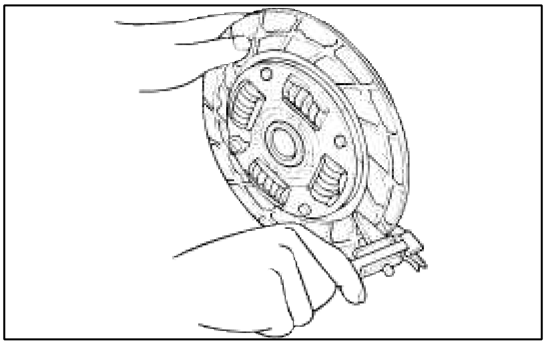
INSPECTION

CLUTCH COVER ASSEMBLY

1. Check the diaphragm spring end for wear and uneven height.
2. Check the pressure plate surface for wear, cracks and color change.
3. Check the rivets for looseness and replace the clutch cover assembly if necessary.

CLUTCH DISC

1. Check the clutch facing for loose rivets, uneven contact, deterioration due to seizure, adhesion of oil, or grease, and replace the clutch disc if defective.
2. Measure the thickness of the disc when free.



3. Check for the torsion spring play and damage and if defective, replace the clutch disc.
4. Clean the splines on the input shaft and install the clutch disc.
   If the disc does not slide smoothly or if play is excessive, replace the clutch disc and/or the input shaft.

CLUTCH RELEASE BEARING

CAUTION

The release bearing is packed with grease. Do not use cleaning solvent or oil.

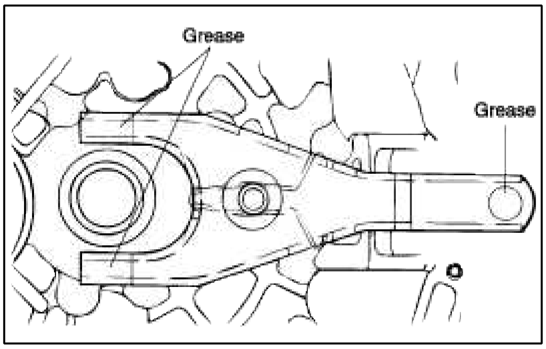
1. Check the bearing for seizure, damage or abnormal noise. Also check the diaphragm spring contacting points for wear.
2. Replace the bearing if the release fork contacting points are worn abnormally.

CLUTCH RELEASE FORK

INSTALLATION

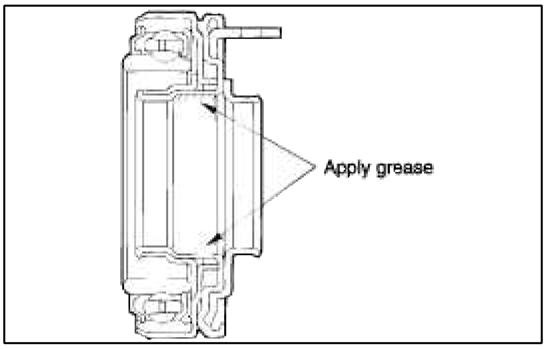
1. Apply multipurpose grease to the release bearing contact surfaces and the release cylinder contact surface of the clutch release fork assembly.

> **CAUTION**
>
> When installing the clutch, apply grease to each part, but be careful not to apply excessive grease. It can cause clutch slippage and judder.



2. Apply multipurpose grease into the groove of the release bearing.

Grease : CASMOLY L9508



3. Apply multipurpose grease to the clutch release lever fulcrum contact surface of the clutch release fork assembly.

Grease : CASMOLY L9508

---

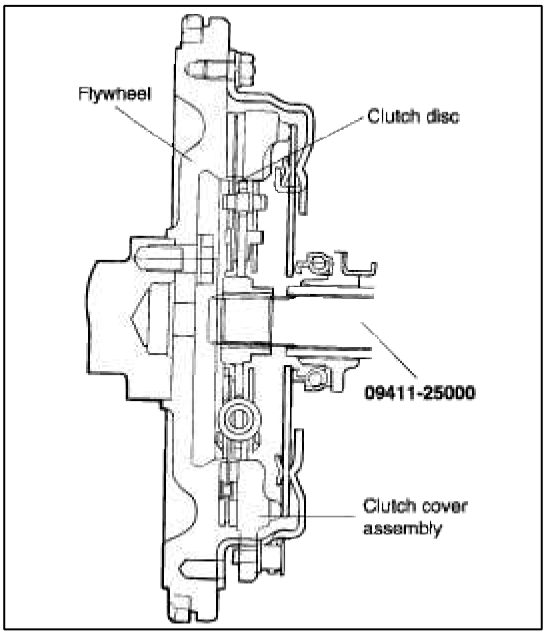
4. Clean the surfaces of the flywheel and pressure plate thoroughly with fine sandpaper or crocus cloth, and make certain that all oil or grease has been removed.
5. Apply a small amount of multipurpose grease to the clutch disc splines and input shaft splines.

Grease : CASMOLY L9508

> **CAUTION**
>
> Do not apply more grease than necessary. Too much grease can cause clutch slip or judder.

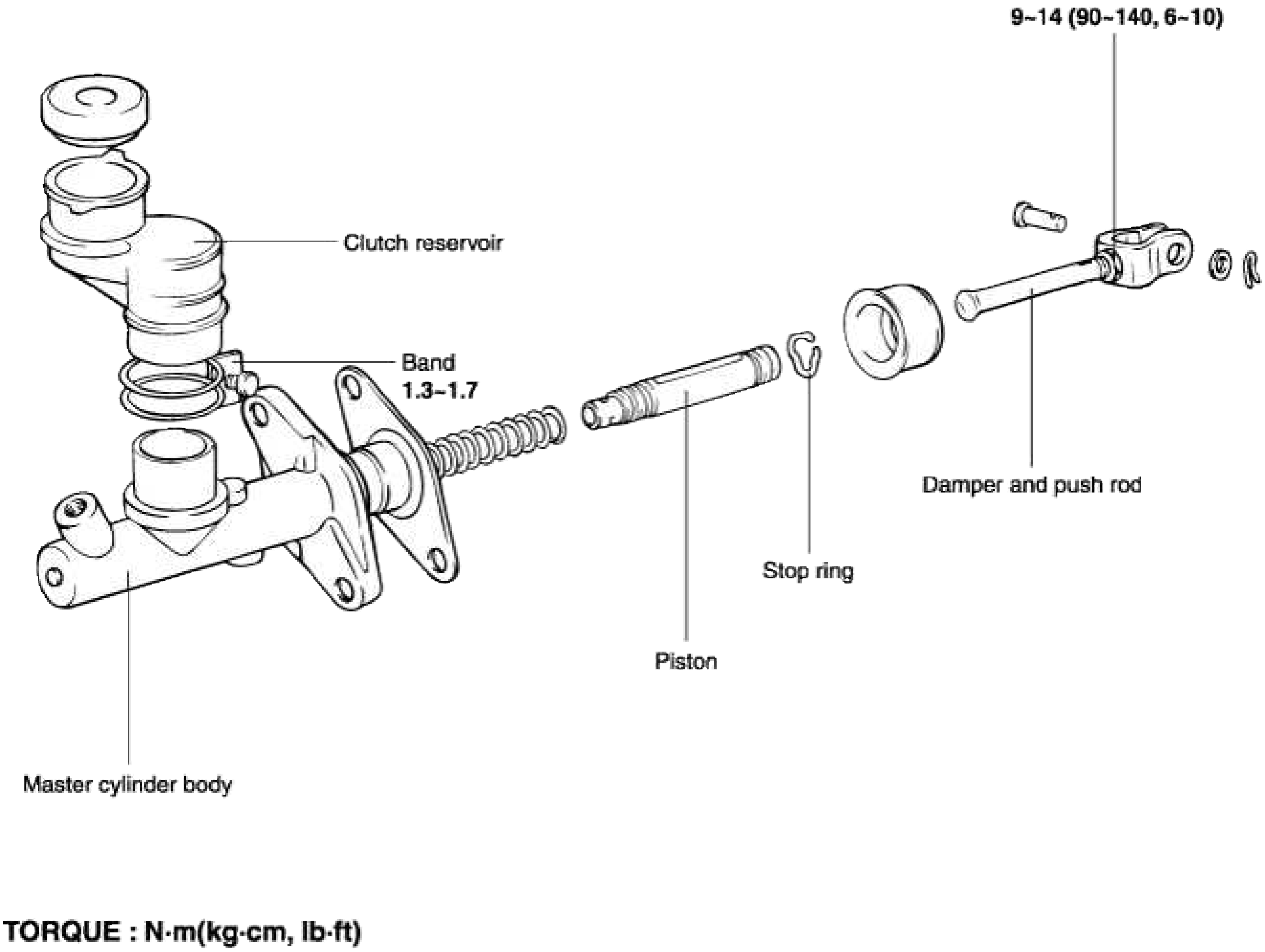
6. Using the special tool (09411-25000), install the clutch disc to the flywheel. When installing the clutch disc, be sure that the surface having the manufactures stamp is towards the pressure plate.
7. Install the the clutch cover assembly onto the flywheel and install the six (6) bolts through the clutch cover into the flywheel.
8. Diagonally tighten the bolts 15-22 Nm (150-220 kg·cm, 11-15 lb·ft).
   Tighten the bolts by one or two turns at a time, in succession, to avoid bending the cover flange.
9. Remove the special tool.
10. Install the transaxle. (Refer to the "TR" group.)

11. Adjust the clutch pedal free-play.


Flywheel
Clutch disc
09411-25000
Clutch cover assembly

Clutch System > Clutch System > Clutch Master Cylinder > Components and Components Location

COMPONENTS


9~14 (90~140, 6~10)
Clutch reservoir
Band
1.3~1.7
Damper and push rod
Stop ring
Piston
Master cylinder body
TORQUE : N·m(kg·cm, lb·ft)

Clutch System > Clutch System > Clutch Master Cylinder > Repair procedures

DISASSEMBLY

1. Remove the piston stop ring.
   (Refer to the components of the master cylinder)
2. Pull out the push rod and piston assembly.

> NOTE
>
> Be careful not to damage the master cylinder body and piston assembly.

INSPECTION

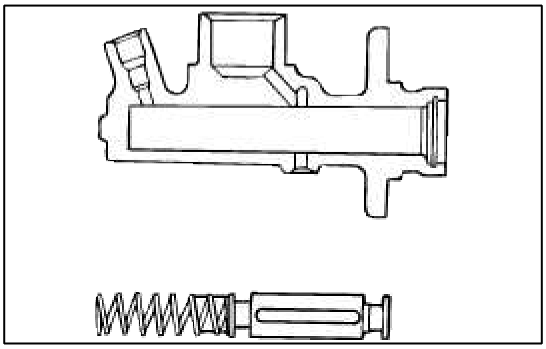
1. Check the inside of the cylinder body for rust, pitting or scoring.
2. Check the piston cup for wear or distortion.
3. Check the piston for rust, pitting or scoring.
4. Check the clutch tube line for obstructions.
5. Measure the clutch master cylinder inside diameter with a cylinder gauge, and the piston outside diameter with a micrometer.

REASSEMBLY

1. Apply the specified fluid to the inner surface of the cylinder body and to the outside of the piston assembly.

Specified fluid : BRAKE FLUID DOT 3 or DOT4

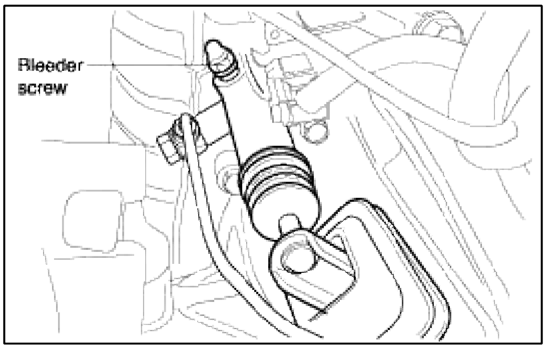
2. Install the piston assembly.
3. Install the piston stop ring
4. Install the push rod assembly. (Refer to the components of the clutch master cylinder.)



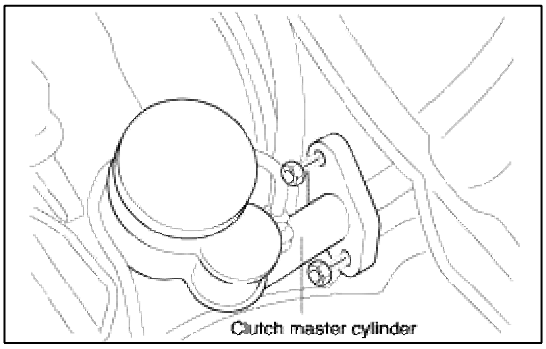
5. Install the clutch hose on the cylinder body.

REMOVAL

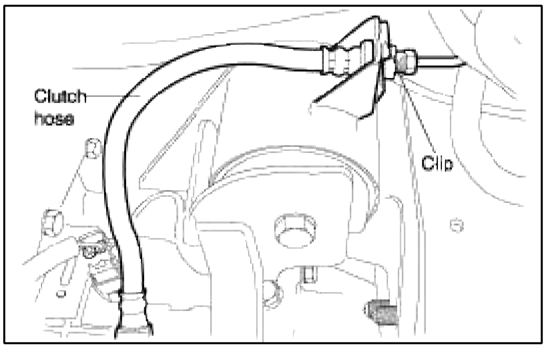
1. Drain the clutch fluid through the bleeder screw.

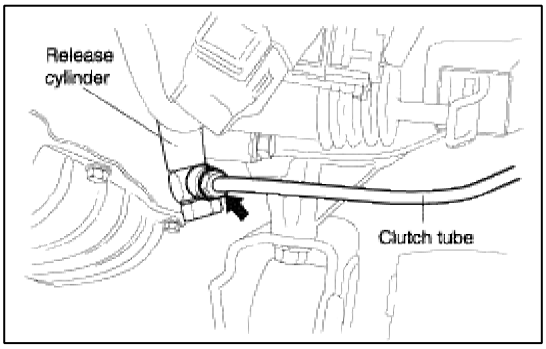


2. Remove the master cylinder mounting nut.

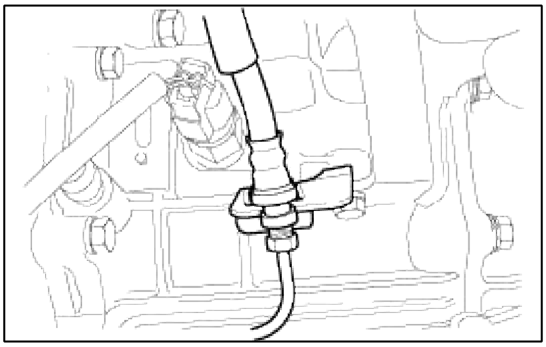

Clutch master cylinder

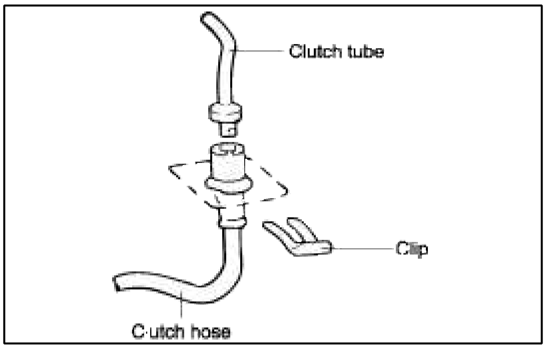
3. Separate the clutch line.


Clutch hose
Clip


Release cylinder
Clutch tube

4. Remove the clutch line clip of the transaxle side.

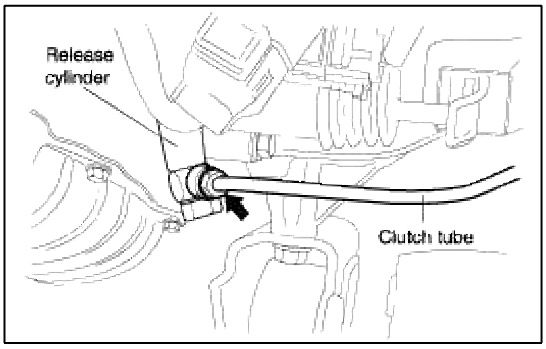



Clutch tube
Clip
C·utch hose

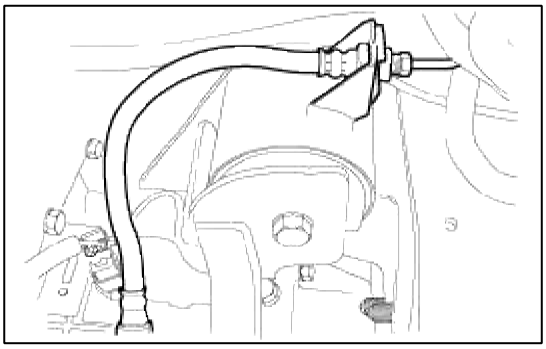
INSPECTION

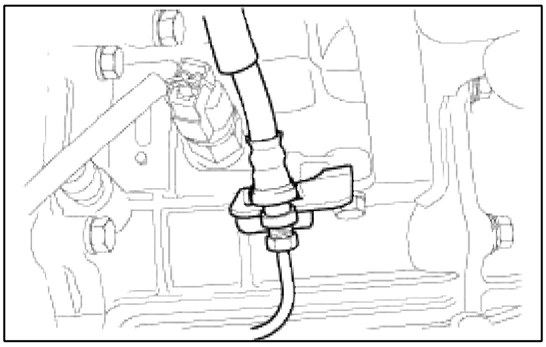
INSTALLATION

1. Install the clutch tube (clutch release cylinder side).

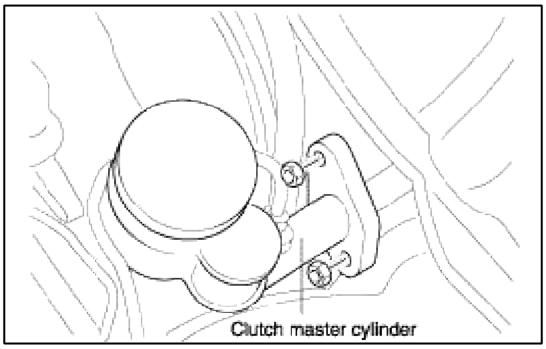

Release cylinder
Clutch tube

2. Install the clutch line and the clip.





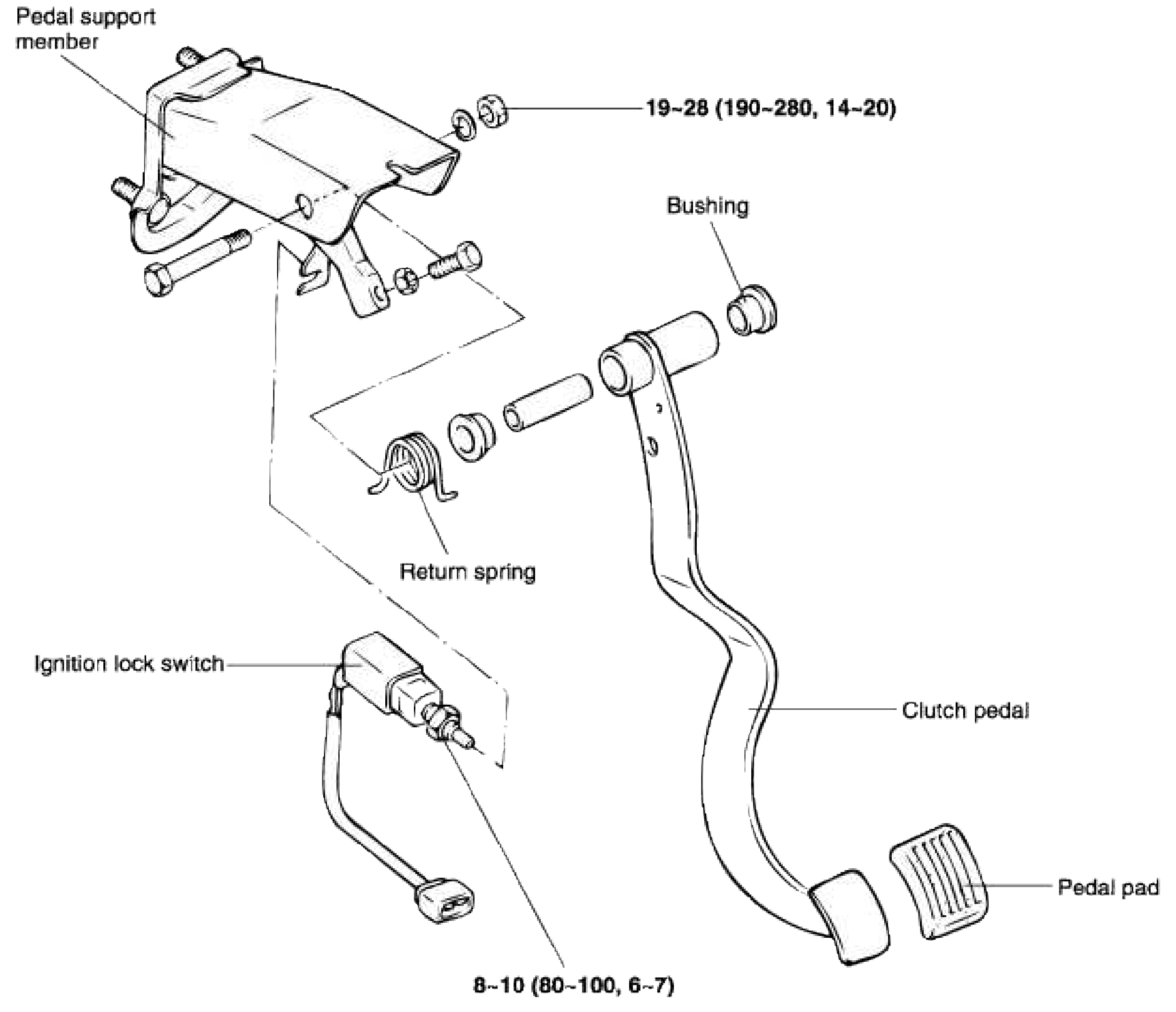
3. Install the clutch master cylinder.


Clutch master cylinder

4. Install the push rod to the clutch pedal.
5. Bleed the system.

Clutch System > Clutch System > Clutch Pedal > Components and Components Location

COMPONENTS

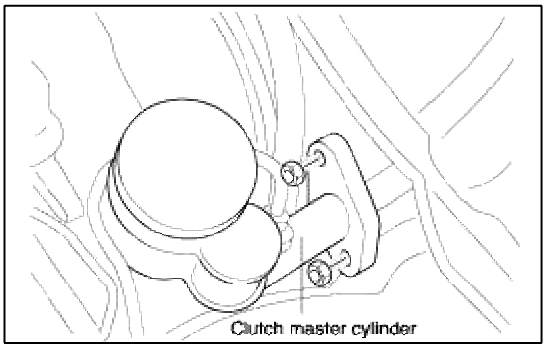

Pedal support member
19~28 (190~280, 14~20)
Bushing
Return spring
Ignition lock switch
Clutch pedal
Pedal pad
8~10 (80~100, 6~7)

TORQUE : Nm (kg·cm, lb·ft)

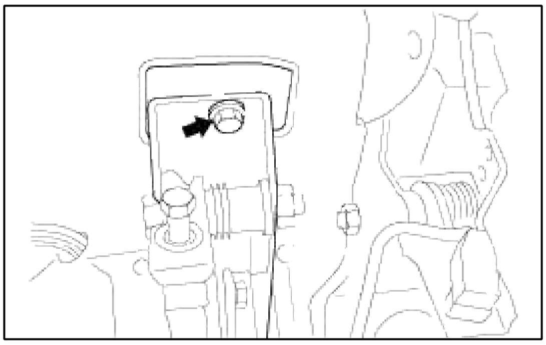
Clutch System > Clutch System > Clutch Pedal > Repair procedures

REMOVAL

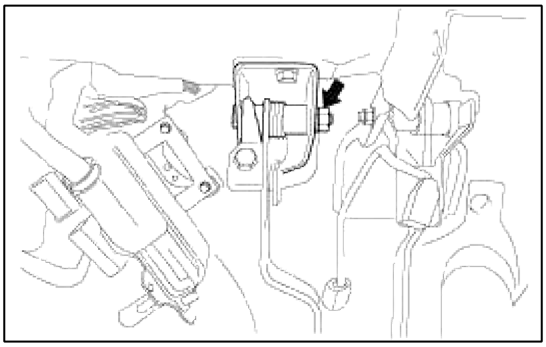
1. Remove the master cylinder mounting nut.



2. Remove the pedal support member mounting bolt.



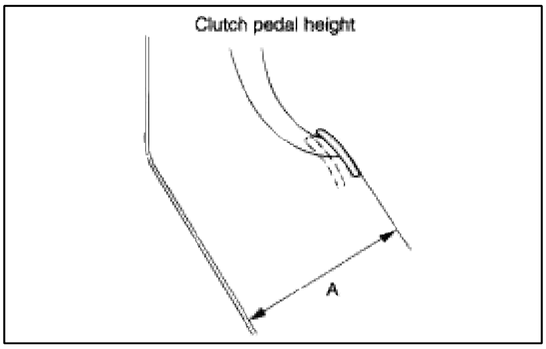
3. Remove the pedal support bolt.



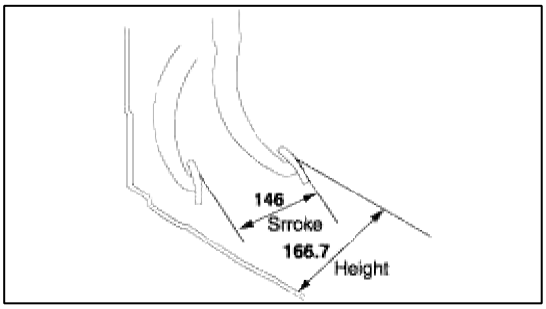
INSPECTION

1. Check the clutch pedal shaft and bushing for wear.
2. Check the clutch pedal for bending or distortion.
3. Check the return spring for damage or deterioration.
4. Check the clutch pedal pad for damage or wear.
5. Measure the clutch pedal height (from the face of the pedal pad to the floorboard).

Standard value : (A) 166.7 mm (6.6 in.)



6. If the clutch pedal height is not within the standard value range, adjust as follows :
   A. Turn and adjust the bolt, then secure by tightening the lock nut.



> **CAUTION**
>
> After the adjustment, tighten the bolt until it reaches the pedal stopper and tighten the lock nut.

   B. Turn the push rod to agree with the standard value and secure the push rod with the lock nut.

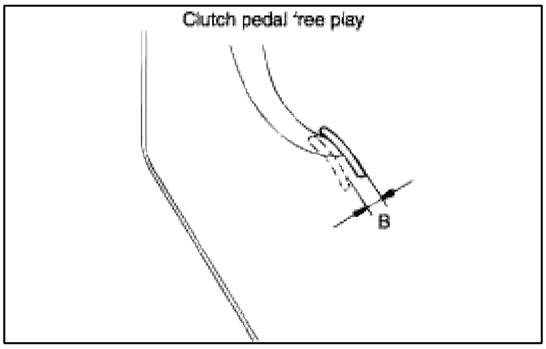
> **CAUTION**
>
> When adjusting the clutch pedal height, be careful not to push the push rod toward the master cylinder.

7. After completing the adjustments, check that the clutch pedal free play (measured at the face of the pedal pad) is within the standard value ranges.

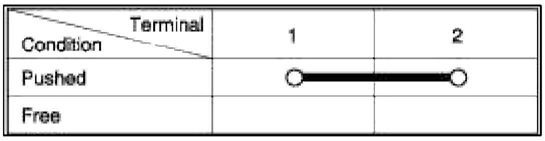
Standard value : (B) 6-13 mm (0.24-0.52 in.)

---

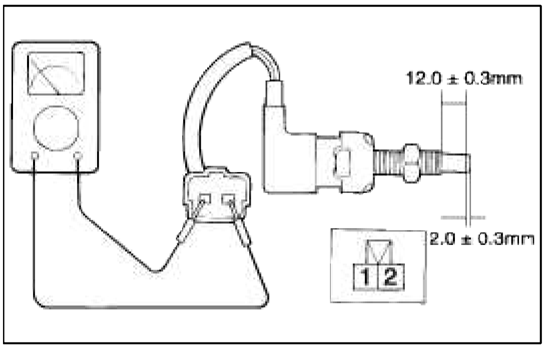
8. If the clutch pedal free play does not meet the standard value, it may be the result of air in the hydraulic system or a faulty clutch master cylinder. Bleed the air or disassemble and inspect the master cylinder or clutch.



IGNITION LOCK SWITCH INSPECTION

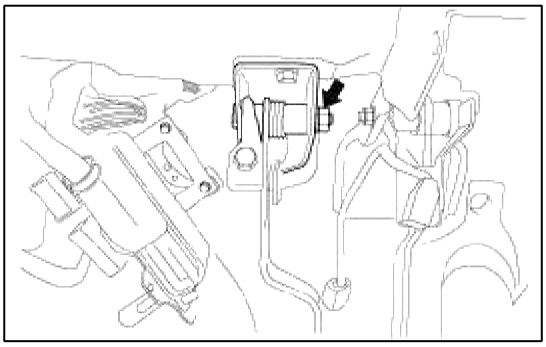


Terminal / Condition	1	2
Pushed	○	○
Free		



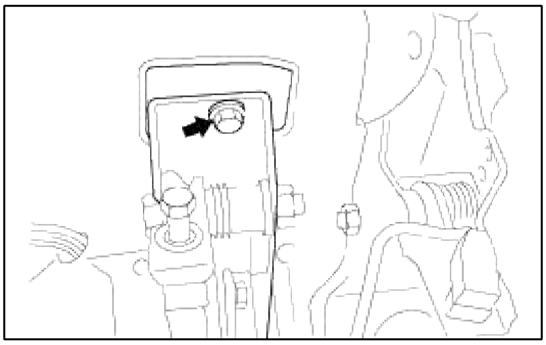
INSTALLATION

1. Apply the multi-purpose grease and install the pedal support bolt.

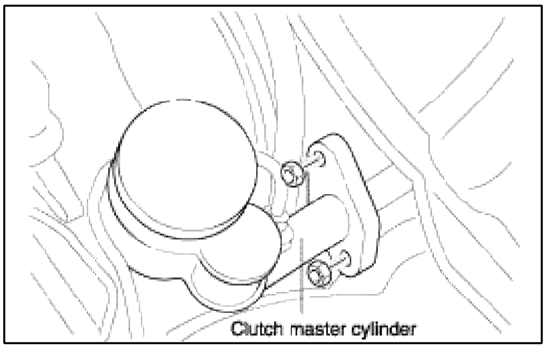


Specified lubricants :
SAE J310a, Chassis grease, NLGI-No.1

2. Install the pedal supprot member mounting bolt.

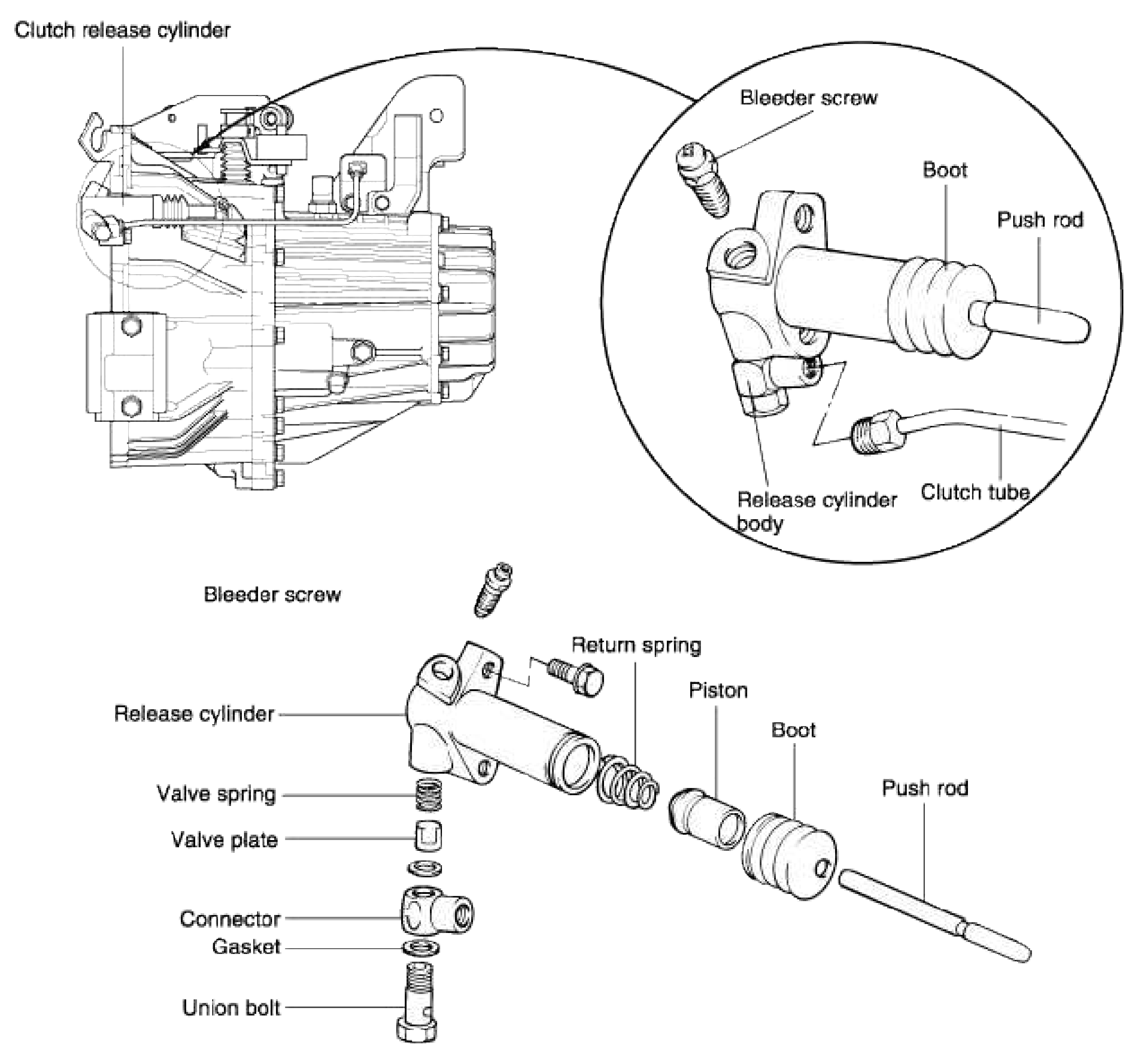


3. Install the master cylinder mounting nut.



Clutch System > Clutch System > Clutch Release Cylinder > Components and Components Location

COMPONENTS


Clutch release cylinder
Bleeder screw
Boot
Push rod
Release cylinder body
Clutch tube
Bleeder screw
Return spring
Release cylinder
Piston
Boot
Push rod
Valve spring
Valve plate
Connector
Gasket
Union bolt

Clutch System > Clutch System > Clutch Release Cylinder > Repair procedures

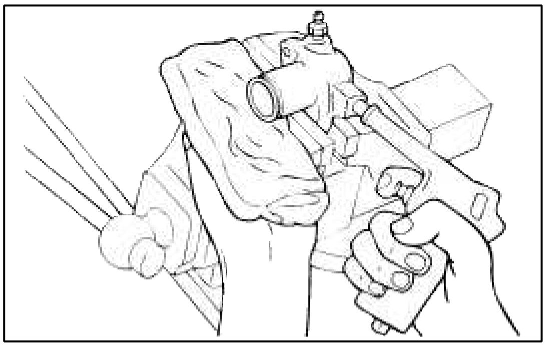
DISASSEMBLY

1. Remove the clutch hose, valve plate, spring, push rod and boot.
2. Remove any dirt from the piston bore opening of the release cylinder.

3. Remove the piston from the release cylinder using compressed air.

CAUTION

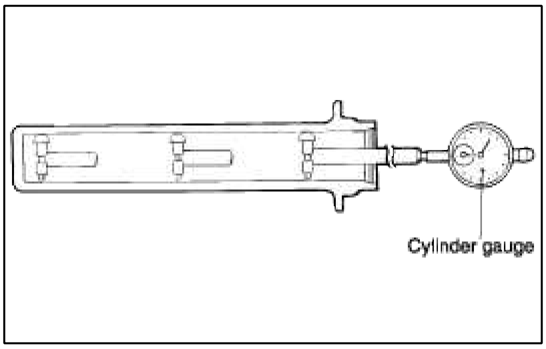
1. Cover the release cylinder with rags to prevent the piston from popping out and causing injury.
2. Apply compressed air slowly to prevent the fluid from splashing in your eyes or on your skin.



INSPECTION

1. Check the release cylinder bore for rust and damage.
2. Measure the release cylinder bore at three locations: bottom, middle and top with a cylinder gauge. Replace the release cylinder assembly if the bore-to-piston clearance exceeds the limit.

Limit : 0.15 mm (0.006 in.)



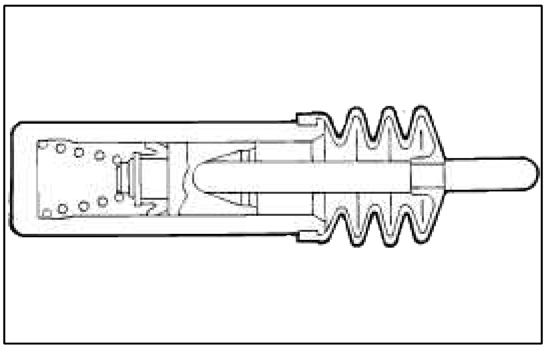
REASSEMBLY

1. Apply specified brake fluid to the release cylinder bore and the outer surface of the piston and piston cup. Push the piston cup assembly into the cylinder.

Use the specified fluid : Brake fluid DOT 3 or DOT 4

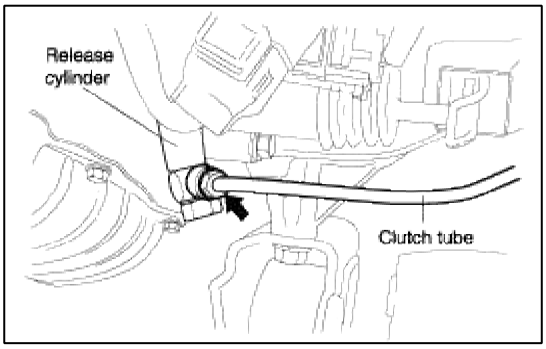
---

2. Install the valve plate, push rod and boot.

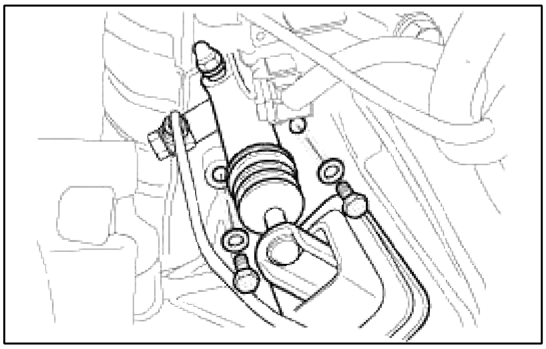


REMOVAL

1. Disconnect the clutch tube.


Release cylinder
Clutch tube

2. Remove the clutch release cylinder mounting bolt.



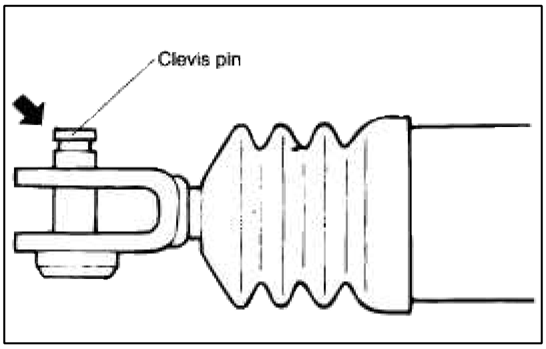
INSPECTION

1. Check the clutch release cylinder for fluid leakage.
2. Check the clutch release cylinder boots for damage.

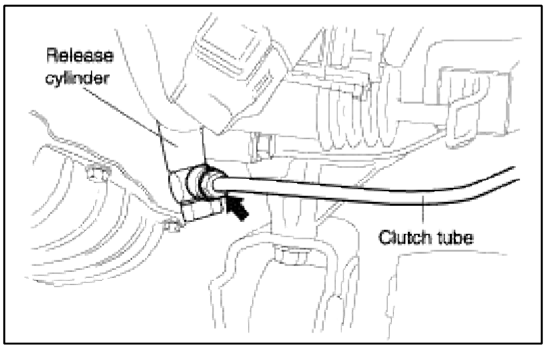
INSTALLATION

1. Coat the clevis pin with the specified grease.

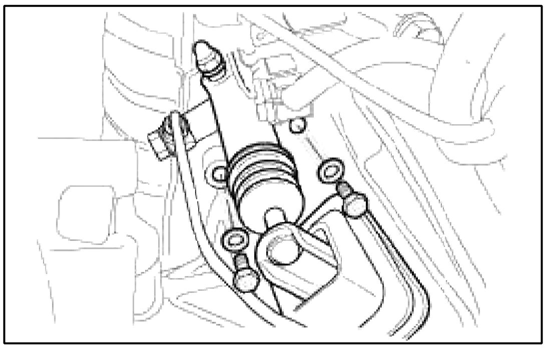
Specified grease : CASMOLY L9508



2. Install the clutch release cylinder, and the clutch tube.


Release cylinder
Clutch tube

3. Install the clutch release cylinder mounting bolt.



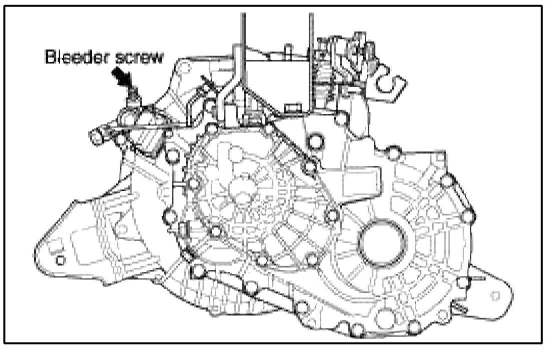
Clutch System > Clutch System > Repair procedures

INSPECTION

BLEEDING

CAUTION

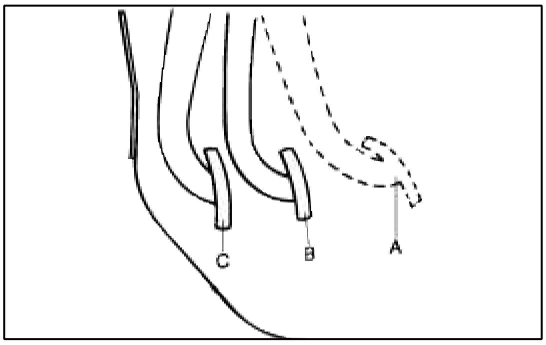
Use the specified fluid. Avoid mixing different brands of fluid. Specified fluid : SAE J1703 (DOT 3 or DOT 4).



1. Loosen the bleeder screw at the clutch release cylinder.
2. Push the clutch pedal down slowly until all air is expelled.
3. Hold the clutch pedal down until the bleeder is retightened.
4. Refill the clutch master cylinder with the specified fluid.

CAUTION

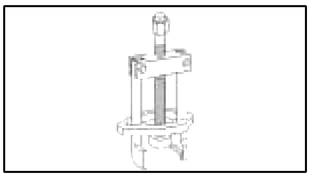
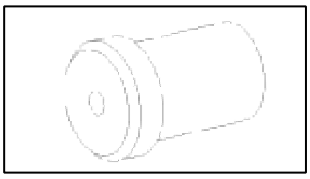
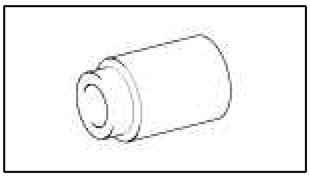
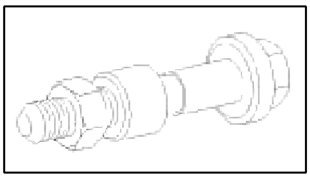
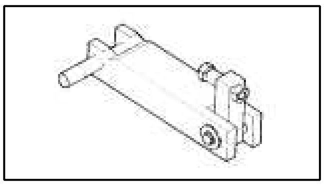
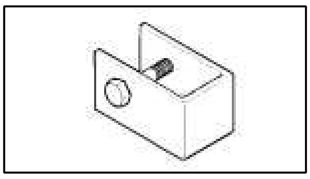
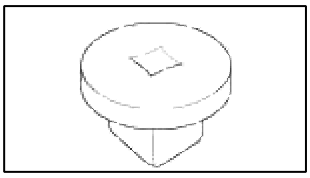
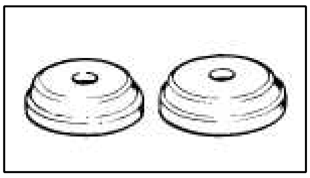
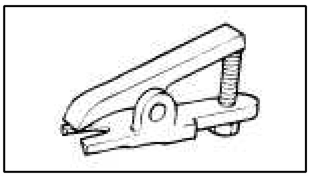
The rapidly-repeated operation of the clutch pedal in B-C range may cause the release cylinder's position to be forced out from the release cylinder body during air bleeding. Repress the clutch pedal after it returns to the "A" point completely.



ACCENT(LC) > 2002 > G 1.5 SOHC > Driveshaft and axle

Driveshaft and axle > General Information > Special Service Tools

SPECIAL TOOLS

Tool (Number and Name)	Illustration	Use
09495-33000 Puller		Removal of wheel bearing inner race from hub.
09495-33100 Center bearing remover and installer		• Removal of wheel bearing from knuckle. (use with 09517-29000) • Installation of hub to knuckle.
09517-21200 Front axle base		• Installation of the rear axle shaft bearing retainer. • Installation of tone wheel and dust cover to B.J.
09517-21500 Front hub remover and installer		• Removal of front hub from knuckle. (use with 09517-29000) • Measurement of front wheel bearing pre-load. (use with 09532-11600)
09517-29000 Knuckle arm bridge		• Removal of front hub from knuckle. (use with 09517-21500) • Removal of wheel bearing outer race from knuckle. (use with 09495-33100)
09517-3A000 Knuckle arm bridge holder		Removal of knuckle arm bridge. (use with 09517-21500, 09517-29000)
09532-11600 Preload socket		Measurement of front wheel bearing pre-load. (use with 09517-21500)
09532-31200A Oil seal installer		Installation of wheel bearing to knuckle.
09568-34000 Ball joint puller		Seperation of front lower arm and tie rod end ball joint.

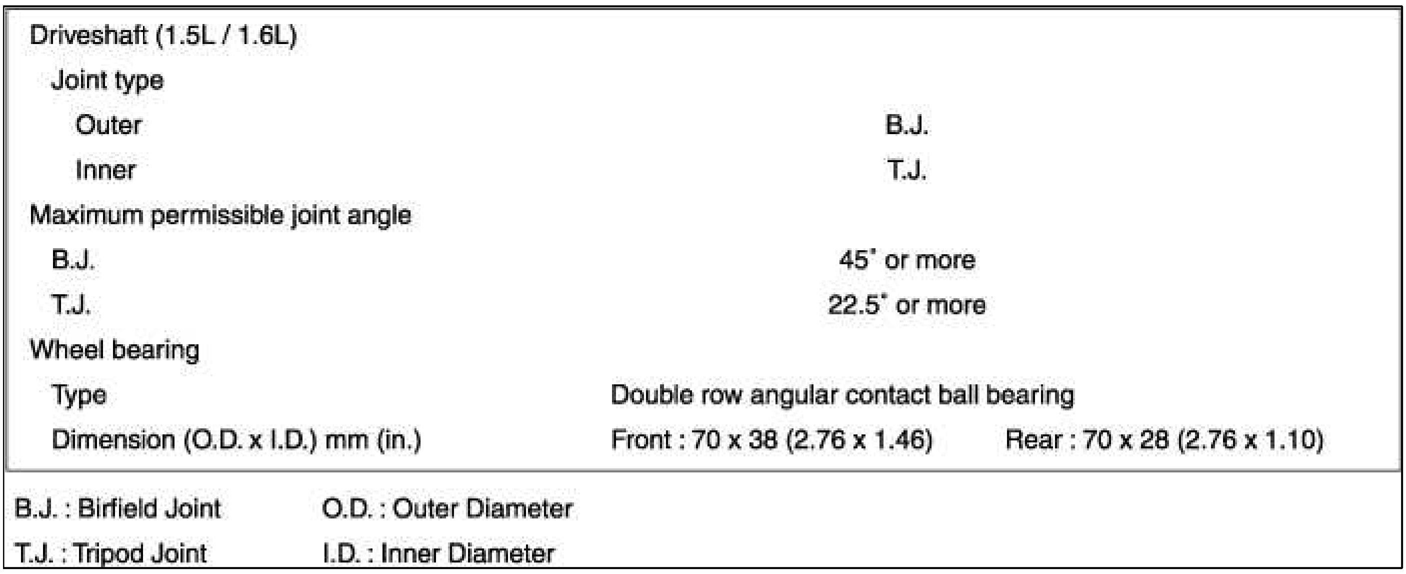
Driveshaft and axle > General Information > Troubleshooting

TROUBLESHOOTING

Symptom	Possible cause	Remedy
Vehicle pulls to one side	Galling of driveshaft ball joint	Replace
	Wear, rattle or galling of wheel bearing	Replace
	Defective front suspension and steering	Adjust or replace
Vibration	Wear, damage or bending of driveshaft	Replace
	Driveshaft rattle and hub serration	Replace
	Wear, rattle or scratching of wheel bearing	Replace
Shimmy	Improper wheel balance	Adjust or replace
	Defective front suspension and steering	Adjust or replace
Excessive noise	Wear, damage or bending of driveshaft	Replace
	Driveshaft rattle and hub serration	Replace
	Driveshaft rattle and side gear serration	Replace
	Wear, rattle or galling of wheel bearing	Replace
	Loose hub nut	Adjust or replace
	Defective front suspension and steering	Adjust or replace

Driveshaft and axle > General Information > Specifications

SPECIFICATIONS



Driveshaft (1.5L / 1.6L)		
Joint type		
Outer	B.J.	
Inner	T.J.	
Maximum permissible joint angle		
B.J.	45° or more	
T.J.	22.5° or more	
Wheel bearing		
Type	Double row angular contact ball bearing	
Dimension (O.D. x I.D.) mm (in.)	Front : 70 x 38 (2.76 x 1.46)	Rear : 70 x 28 (2.76 x 1.10)

B.J. : Birfield Joint O.D. : Outer Diameter

T.J. : Tripod Joint I.D. : Inner Diameter

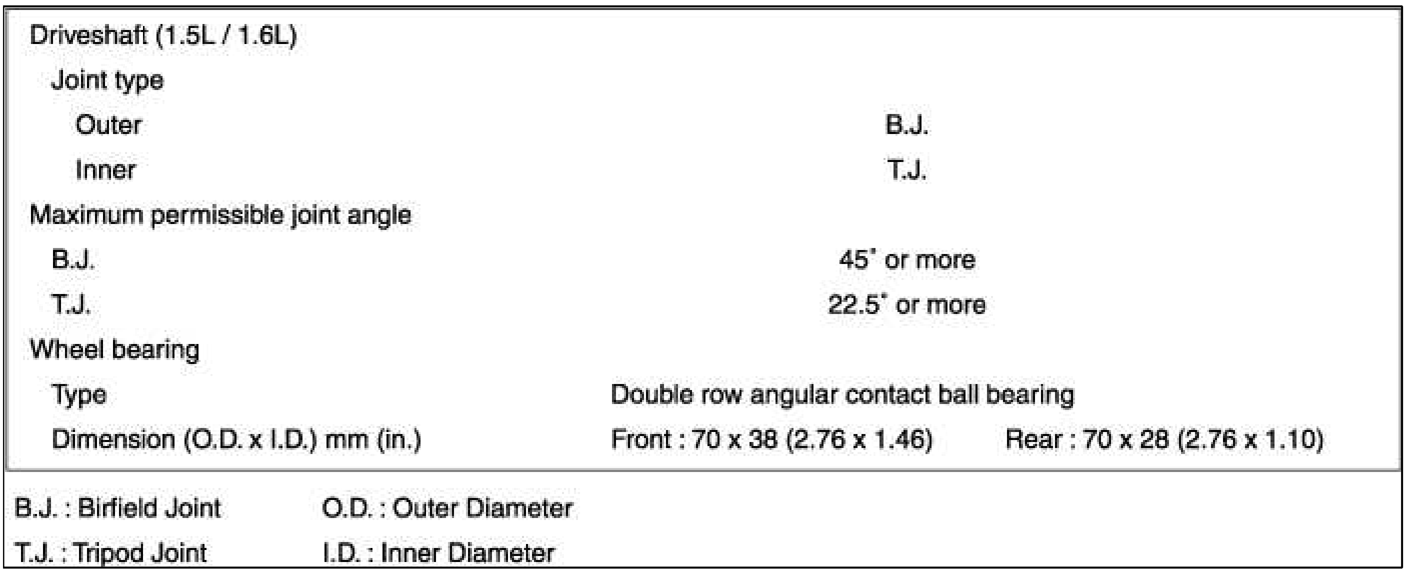
TIGHTENING TORQUE

Item	Nm	Kg·cm	lb·ft
Castle nut	220 ~ 260	2200 ~ 2600	159 ~ 188
Knuckle to strut assembly nut	75 ~ 90	750 ~ 900	54 ~ 65
Lower arm ball joint to knuckle nut	60 ~ 72	600 ~ 720	43 ~ 52
Wheel nut	90 ~ 110	900 ~ 1100	66 ~ 81
Rear hub bearing flange nut	180 ~ 220	1800 ~ 2200	133 ~ 162
Rear strut to carrier nut	75 ~ 90	750 ~ 900	55 ~ 66
Trailing arm to carrier nut	130 ~ 150	1300 ~ 1500	96 ~ 110
Rear suspension arm to carrier nut	130 ~ 150	1300 ~ 1500	96 ~ 110
Stabilizer bracket nut	17 ~ 26	170 ~ 260	12 ~ 19
Stabilizer assembled nut	35 ~ 45	350 ~ 450	25 ~ 33
Rear suspension arm flange nut	100 ~ 120	1000 ~ 1200	72 ~ 87
Rear suspension arm cam bolt	80 ~ 100	800 ~ 1000	58 ~ 72
Front hub to brake disk screw	10 ~ 20	100 ~ 200	7 ~ 14

CAUTION

Replace the self-locking nuts with new ones after removal.

SPECIFICATIONS



Driveshaft (1.5L / 1.6L)		
Joint type		
Outer	B.J.	
Inner	T.J.	
Maximum permissible joint angle		
B.J.	45° or more	
T.J.	22.5° or more	
Wheel bearing		
Type	Double row angular contact ball bearing	
Dimension (O.D. x I.D.) mm (in.)	Front : 70 x 38 (2.76 x 1.46)	Rear : 70 x 28 (2.76 x 1.10)

B.J. : Birfield Joint
O.D. : Outer Diameter
T.J. : Tripod Joint
I.D. : Inner Diameter

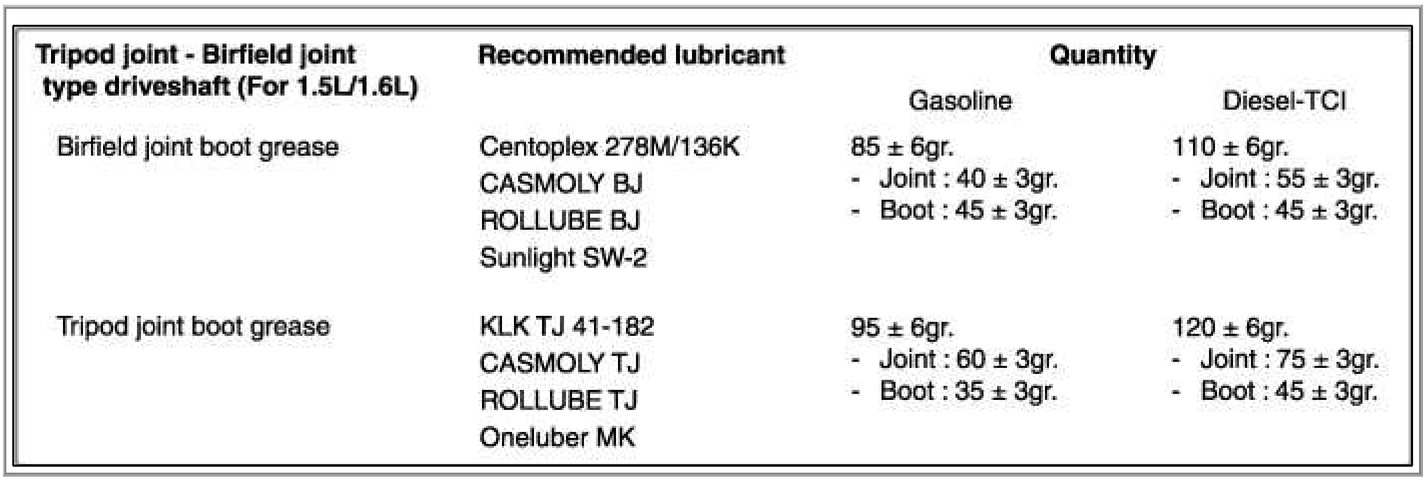
TIGHTENING TORQUE

Item	Nm	Kg·cm	lb·ft
Castle nut	220 ~ 260	2200 ~ 2600	159 ~ 188
Knuckle to strut assembly nut	75 ~ 90	750 ~ 900	54 ~ 65
Lower arm ball joint to knuckle nut	60 ~ 72	600 ~ 720	43 ~ 52
Wheel nut	90 ~ 110	900 ~ 1100	66 ~ 81
Rear hub bearing flange nut	180 ~ 220	1800 ~ 2200	133 ~ 162
Rear strut to carrier nut	75 ~ 90	750 ~ 900	55 ~ 66
Trailing arm to carrier nut	130 ~ 150	1300 ~ 1500	96 ~ 110
Rear suspension arm to carrier nut	130 ~ 150	1300 ~ 1500	96 ~ 110
Stabilizer bracket nut	17 ~ 26	170 ~ 260	12 ~ 19
Stabilizer assembled nut	35 ~ 45	350 ~ 450	25 ~ 33
Rear suspension arm flange nut	100 ~ 120	1000 ~ 1200	72 ~ 87
Rear suspension arm cam bolt	80 ~ 100	800 ~ 1000	58 ~ 72
Front hub to brake disk screw	10 ~ 20	100 ~ 200	7 ~ 14

CAUTION

Replace the self-locking nuts with new ones after removal.

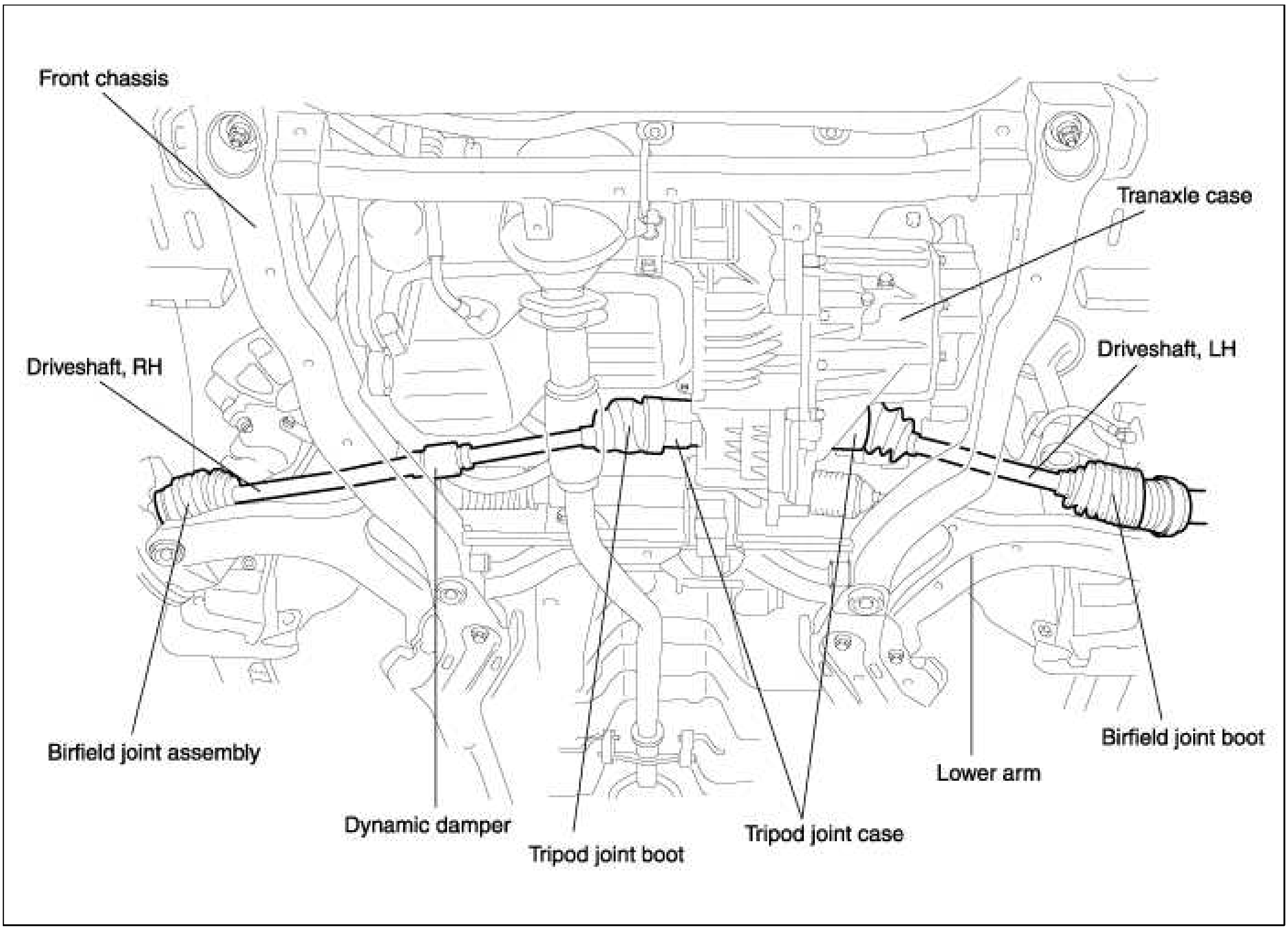
LUBRICANTS



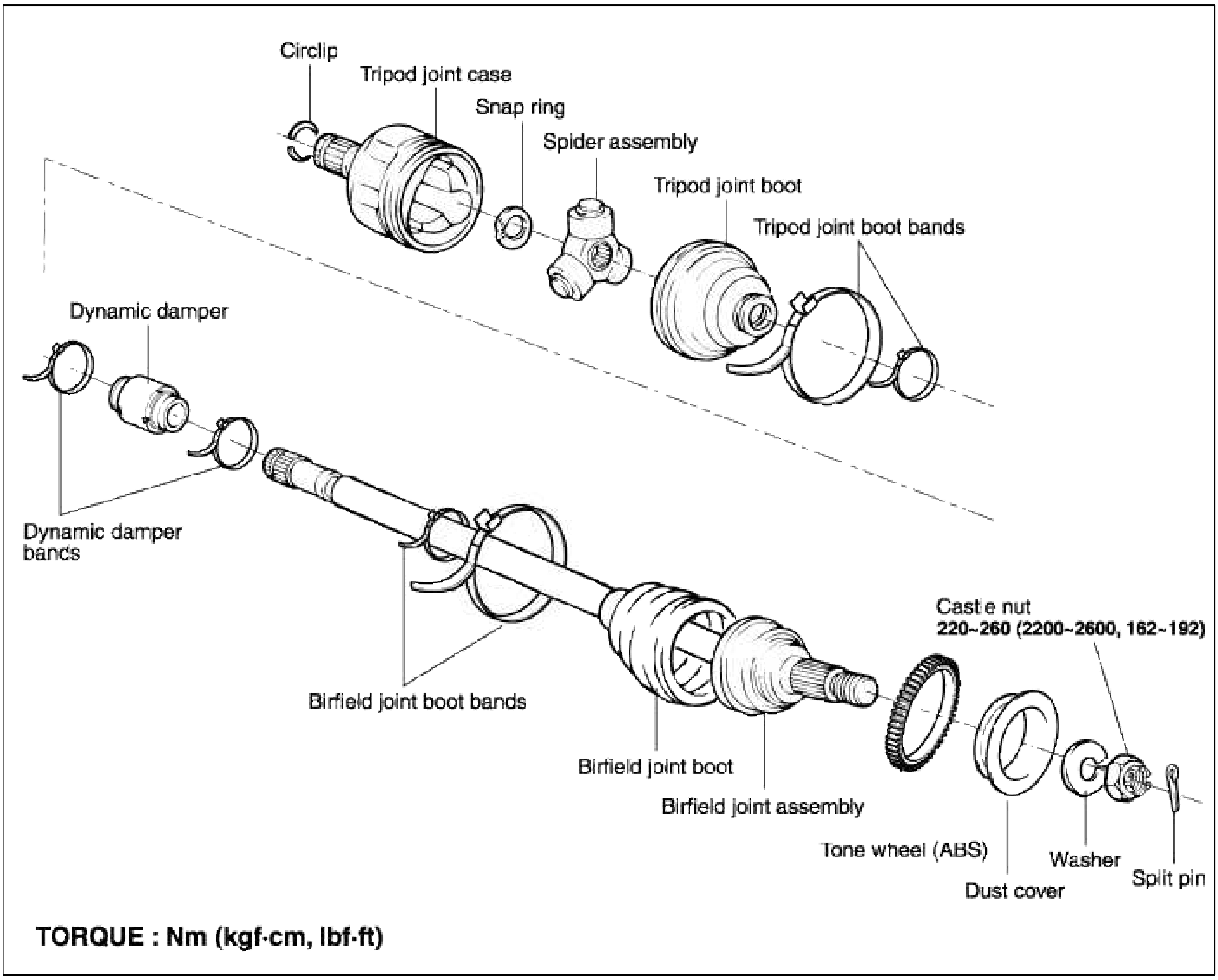
Tripod joint - Birfield joint type driveshaft (For 1.5L/1.6L)	Recommended lubricant	Quantity	
		Gasoline	Diesel-TCI
Birfield joint boot grease	Centoplex 278M/136K CASMOLY BJ ROLLUBE BJ Sunlight SW-2	85 ± 6gr. - Joint : 40 ± 3gr. - Boot : 45 ± 3gr.	110 ± 6gr. - Joint : 55 ± 3gr. - Boot : 45 ± 3gr.
Tripod joint boot grease	KLK TJ 41-182 CASMOLY TJ ROLLUBE TJ Oneluber MK	95 ± 6gr. - Joint : 60 ± 3gr. - Boot : 35 ± 3gr.	120 ± 6gr. - Joint : 75 ± 3gr. - Boot : 45 ± 3gr.

Driveshaft and axle > Driveshaft Assembly > Front Driveshaft > Components and Components Location

COMPONENTS


Front chassis
Tranaxle case
Driveshaft, RH
Driveshaft, LH
Birfield joint assembly
Birfield joint boot
Lower arm
Dynamic damper
Tripod joint boot
Tripod joint case

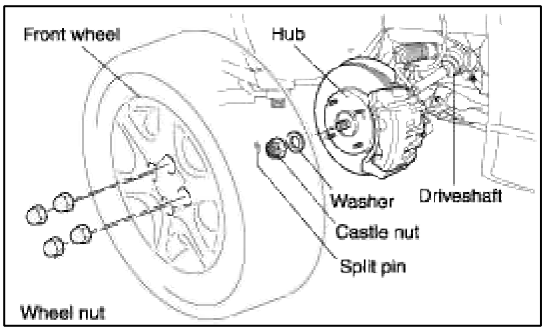
COMPONENTS


Circlip
Tripod joint case
Snap ring
Spider assembly
Tripod joint boot
Tripod joint boot bands
Dynamic damper
Dynamic damper bands
Birfield joint boot bands
Birfield joint boot
Birfield joint assembly
Castle nut
220~260 (2200~2600, 162~192)
Tone wheel (ABS)
Dust cover
Washer
Split pin
TORQUE : Nm (kgf·cm, lbf·ft)

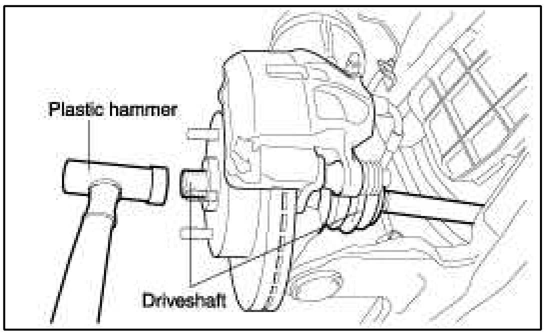
Driveshaft and axle > Driveshaft Assembly > Front Driveshaft > Repair procedures

REMOVAL

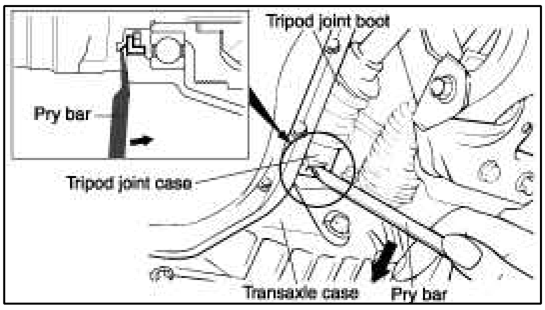
1. Loosen the wheel nuts slightly.
2. Raise the front of the vehicle, and support it with safety stands in a proper location.
3. Remove the wheel nuts and front wheel.


Front wheel
Hub
Washer
Driveshaft
Castle nut
Split pin
Wheel nut

4. Remove the split pin, the castle nut and the washer from the front hub.
5. Drain the transmission fluid before the driveshaft is removed.
6. Using a plastic hammer, make the driveshaft disconnected from the axle hub.


Plastic hammer
Driveshaft

7. Push the axle hub outward and separate the driveshaft from the axle hub.
8. Insert a pry bar between the transaxle case and the tripod joint case, and pry the driveshaft from the transaxle case.


Tripod joint boot
Pry bar
Tripod joint case
Transaxle case
Pry bar

CAUTION

- Be sure to apply the pry bar to the rib of the transaxle case.
- Do not insert the pry bar too deeply, as this may cause damage to the oil seal. [max. depth : 7 mm (0.28 in.)]
- For automatic transaxle equipped vehicles, insert a pry bar into the groove of the driveshaft to remove the driveshaft from the transaxle.
- Do not pull on the driveshaft; the joints may come apart. Be sure to use the pry bar.

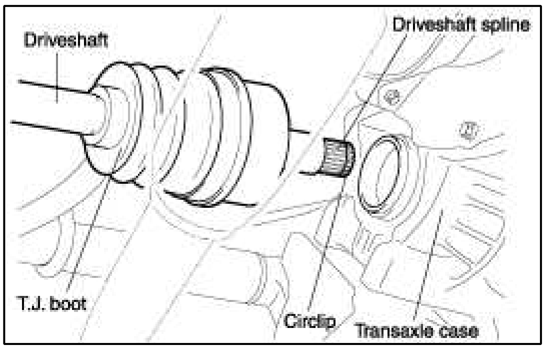
9. Pull out the driveshaft from the transaxle case.

CAUTION

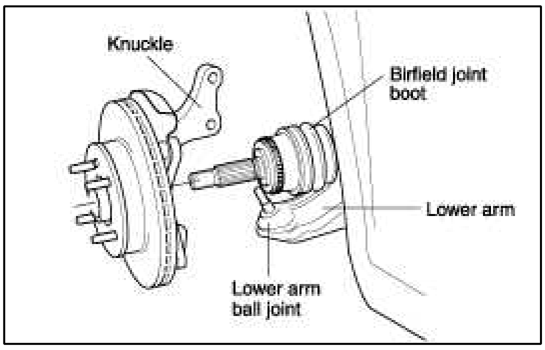
- Place a plug in the hole of the transaxle case to prevent contamination
- Support the driveshaft properly.
- Replace the circlip each time the driveshaft is removed from the transaxle case.

INSTALLATION

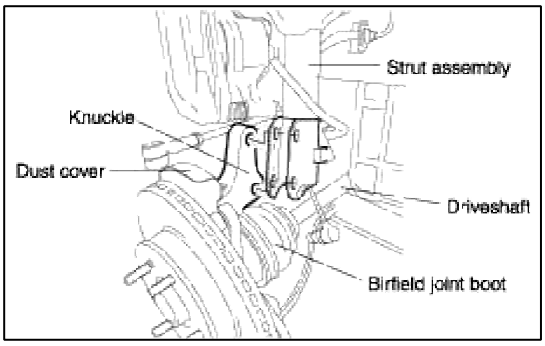
1. Coat gear oil on the driveshaft splines and transaxle case-sliding surface.


Driveshaft
Driveshaft spline
T.J. boot
Circlip
Transaxle case

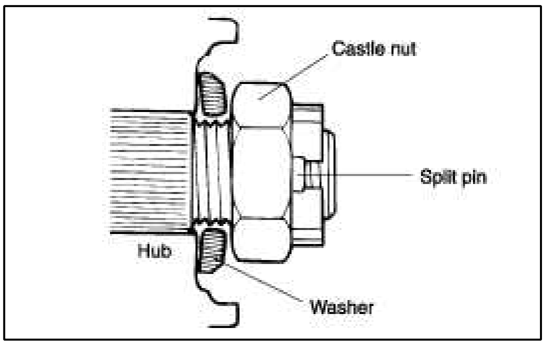
2. Before installing the driveshaft, set the opening side of the circlip facing downward.
3. Assemble the dust cover, the hub, the brake disc and the wheel bearing to the knuckle.
4. Install the birfield joint into the knuckle.


Knuckle
Birfield joint boot
Lower arm
Lower arm ball joint

5. In practice, the knuckle should be installed in the lower arm the moment the birfield joint is installed in the knuckle. Be careful not to damage the boot.
6. Install the knuckle in the strut assembly with the tightening torque, 75~90 Nm (750~900 kg·cm, 54~65 lb·ft).


Strut assembly
Knuckle
Dust cover
Driveshaft
Birfield joint boot

7. Install the lower arm in the knuckle with the tightening torque 60~72 Nm (600~720 kg·cm, 43~52 lb·ft).
8. After the installation, check on the driveshaft for manuever by hand.
9. After installing the washer with convex surface outward, install the castle nut and the split pin.

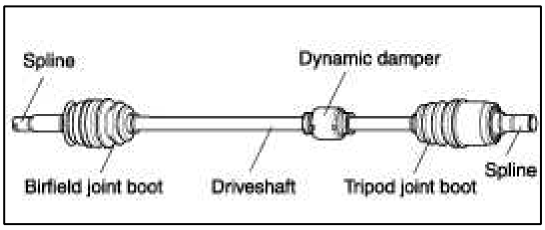

Castle nut
Split pin
Hub
Washer

10. Install the wheel and tire.

INSPECTION

1. Check the boots on the driveshaft for cracks, damage, leaking grease and loose boot bands. If any damage is found, replace the boot and boot bands.
2. Check the joints for wear and operating condition.

3. Turn the driveshaft by hand and make sure the splines and the joints are not excessively loose. If damage is found, replace the joint.


Spline
Dynamic damper
Birfield joint boot
Driveshaft
Tripod joint boot
Spline

4. Check the splines for wear and damage.
5. Make sure the driveshaft is not twisted or cracked. Replace it if necessary.

DISASSEMBLY

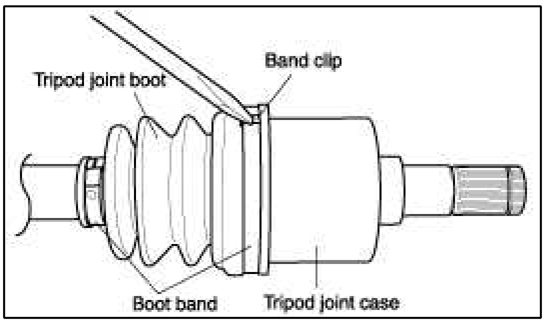
NOTE

- Do not disassemble the birfield joint assembly.
- The driveshaft joint uses special grease. Do not substitute with another type of grease. (refer to LUBRICANTS, DS-p.3)
- The boot band should be replaced with a new one.

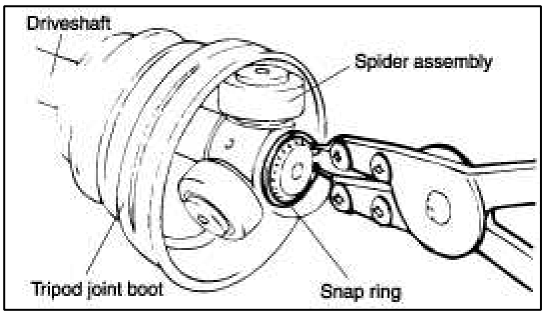
1. Loosen the tripod joint boot bands and pull the tripod joint boot from the tripod joint case.

NOTE

Be careful not to damage the boot.

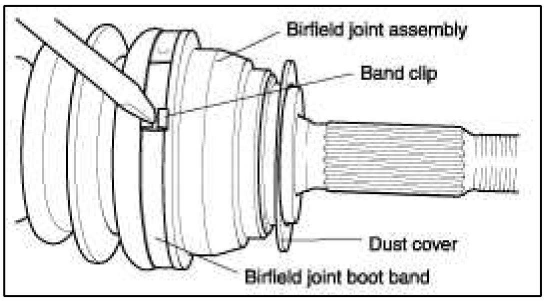

Tripod joint boot
Band clip
Boot band
Tripod joint case

2. Seperate the tripod joint boot from the tripod joint case.
3. Remove the snap ring and spider assembly from the driveshaft.


Driveshaft
Spider assembly
Tripod joint boot
Snap ring

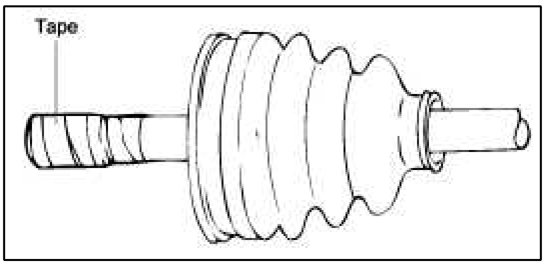
4. Clean the spider assembly.

5. Remove the birfield joint boot bands and pull out the birfield joint boot.

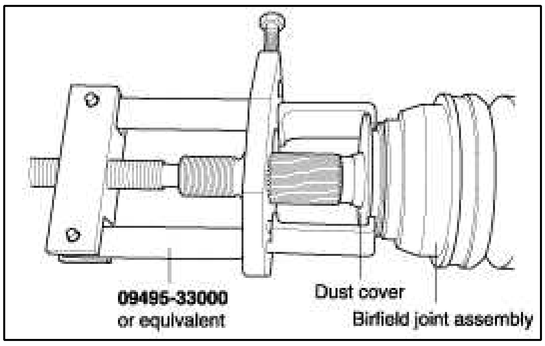

Birfield joint assembly
Band clip
Dust cover
Birfield joint boot band

NOTE

If the boot is to be reused, wrap tape around the driveshaft splines to protect the boot.

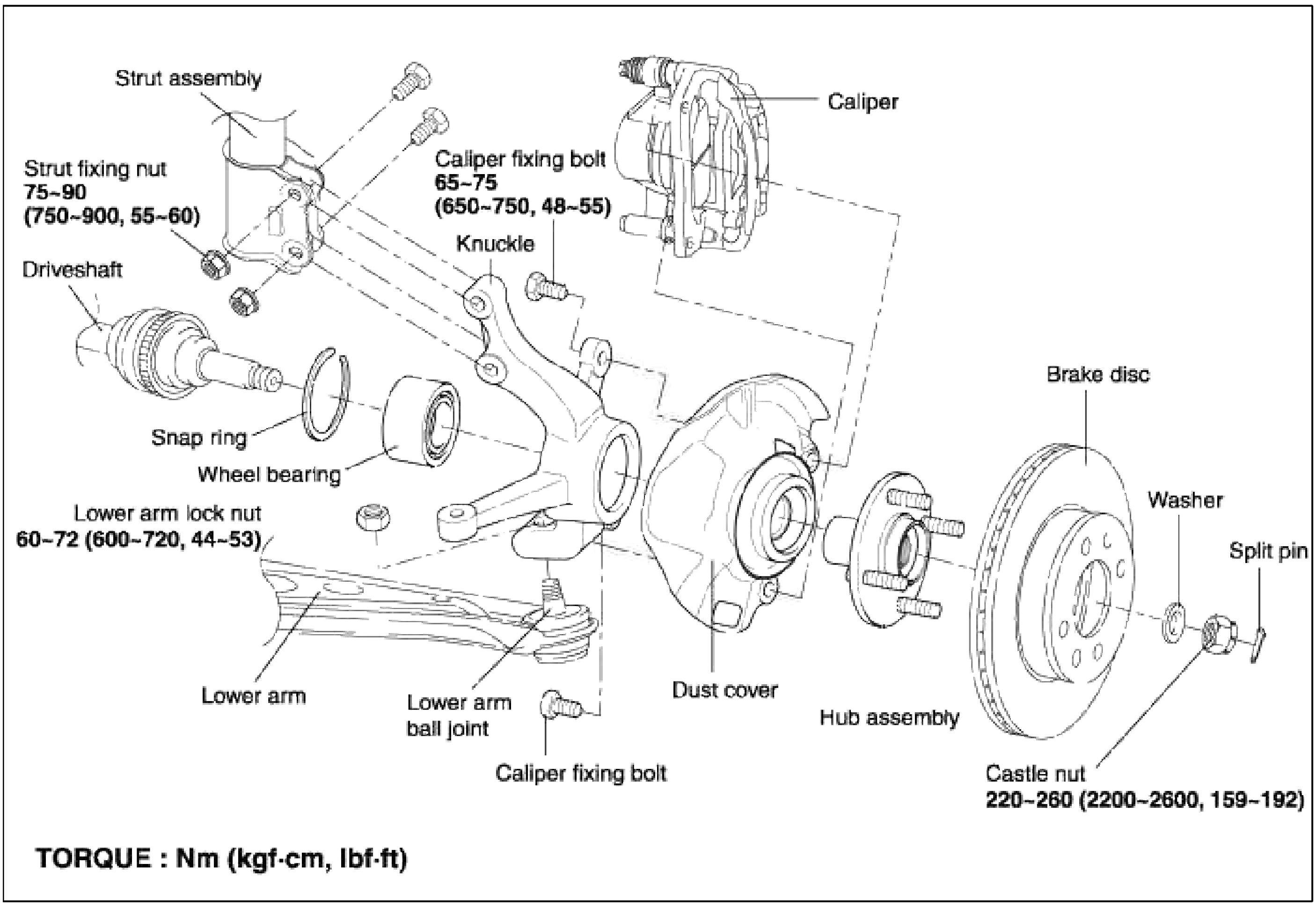


6. Remove the dust cover from the birfield joint assembly using the special tool(09495-33000) or a proper one.


09495-33000
or equivalent
Dust cover
Birfield joint assembly

Driveshaft and axle > Front Axle Assembly > Front Hub / Axle > Components and Components Location

COMPONENTS


Strut assembly
Strut fixing nut
75~90
(750~900, 55~60)
Driveshaft
Caliper fixing bolt
65~75
(650~750, 48~55)
Knuckle
Caliper
Brake disc
Snap ring
Wheel bearing
Lower arm lock nut
60~72 (600~720, 44~53)
Washer
Split pin
Lower arm
Lower arm
ball joint
Dust cover
Hub assembly
Caliper fixing bolt
Castle nut
220~260 (2200~2600, 159~192)
TORQUE : Nm (kgf·cm, lbf·ft)

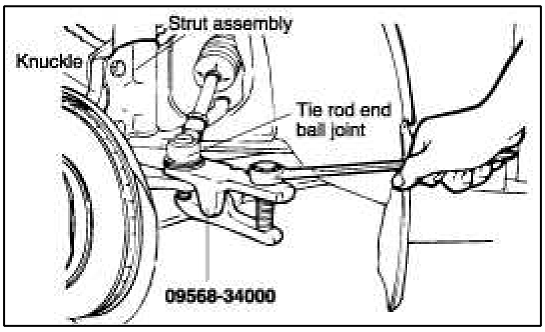
Driveshaft and axle > Front Axle Assembly > Front Hub / Axle > Repair procedures

REMOVAL

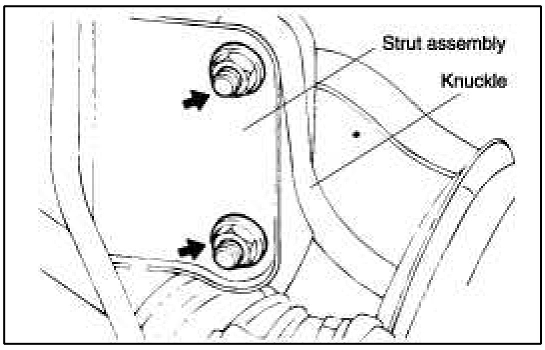
1. Raise the vehicle and remove the front wheel.
2. Remove the castle nut.
3. Remove the front caliper assembly from the knuckle and suspend it with a wire.
4. Remove the wheel speed sensor from the knuckle.
5. Disconnect the tie rod end ball joint from the knuckle using the Special Tool (09568-34000).

NOTE

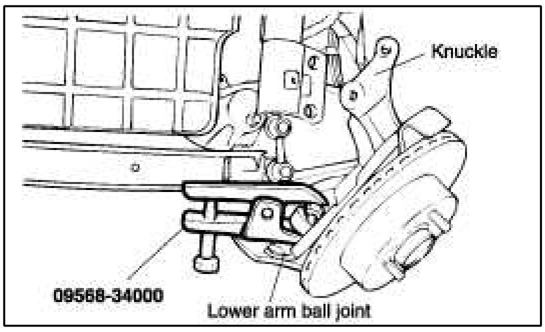
- Be sure to tie the cord of the Special Tool (09568-34000) to the nearby part.
- Loosen the nut, but do not remove it.


Strut assembly
Knuckle
Tie rod end ball joint
09568-34000

6. Disconnect the strut assembly from the knuckle.


Strut assembly
Knuckle

7. Disconnect the driveshaft from the hub.
8. Disconnect the lower arm ball joint from the knuckle using the Special Tool (09568-34000).


Knuckle
09568-34000
Lower arm ball joint

9. Remove the hub and knuckle as an assembly.

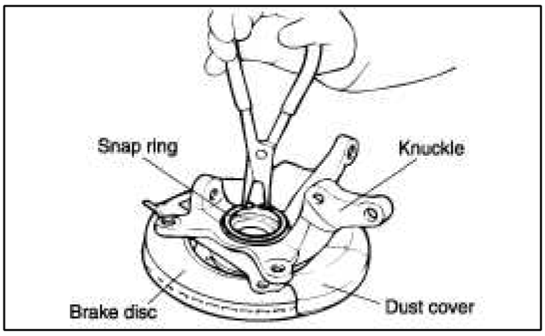
INSTALLATION

Installation is in the reverse order of removal. (See page DS-13.)

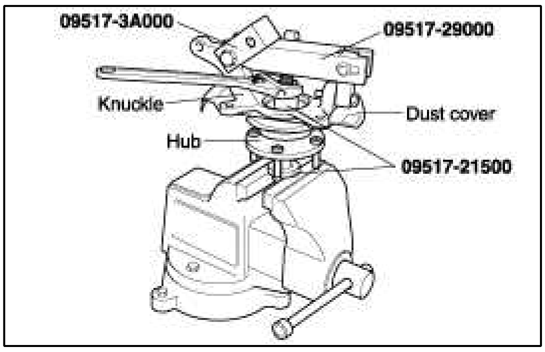
DISASSEMBLY

1. Remove the brake disc from the hub.

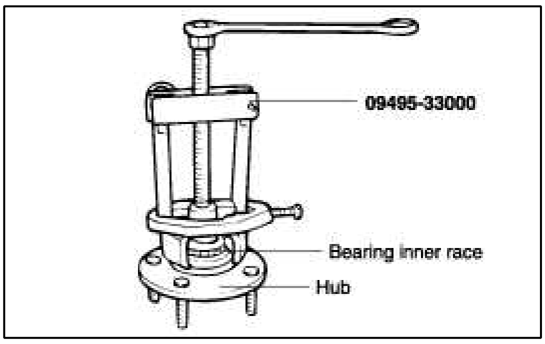
2. Remove the snap ring.


Snap ring
Knuckle
Brake disc
Dust cover

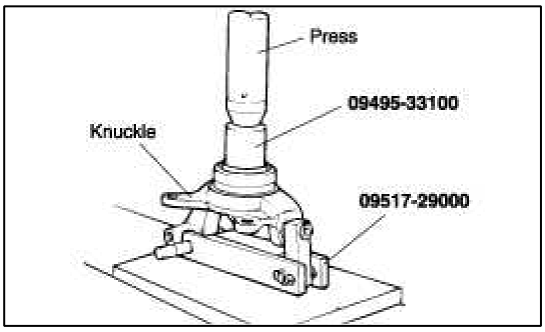
3. Install the Special Tool(09517-21500, 09517-29000, 09517-3A000) as illustrated.


09517-3A000
09517-29000
Knuckle
Dust cover
Hub
09517-21500

4. Remove the hub from the knuckle by turning the nut of the Special Tool (09517-21500).
5. Remove the Special Tool (09517-21500, 09517-29000, 09517-3A000) and the dust cover.
6. Remove the bearing inner race from the hub using the Special Tool (09495-33000).


09495-33000
Bearing inner race
Hub

7. Using the Special Tool (09495-33100, 09517-29000), remove the wheel bearing outer race from the knuckle.


Press
09495-33100
Knuckle
09517-29000

INSPECTION

1. Check the hub for cracks and the splines for wear.
2. Check the brake disc for scoring and damage.
3. Check the knuckle for cracks.
4. Check the snap ring for crack or damage.

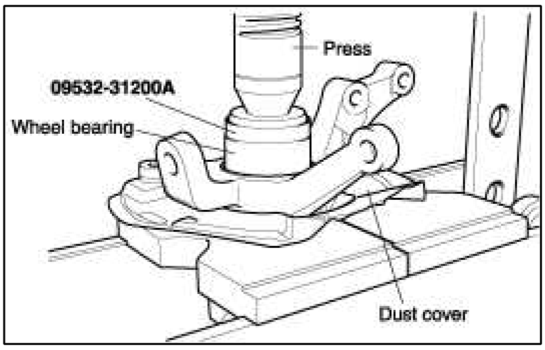
REASSEMBLY

1. Apply a thin coat of multi-purpose grease to the knuckle and bearing contact surface.
2. Using the Special Tool (09532-31200A), press the bearing into the knuckle.

NOTE

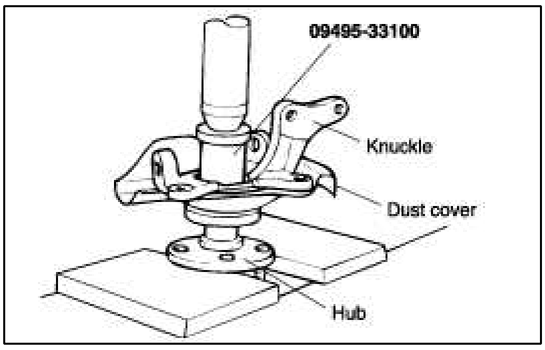
- Do not press on the inner race of the wheel bearing. That will cause damage to the bearing assembly.
- When installing a bearing assembly, always use a new one.
- Left and right bearing must be from one manufacturer.

3. Install the dust cover.

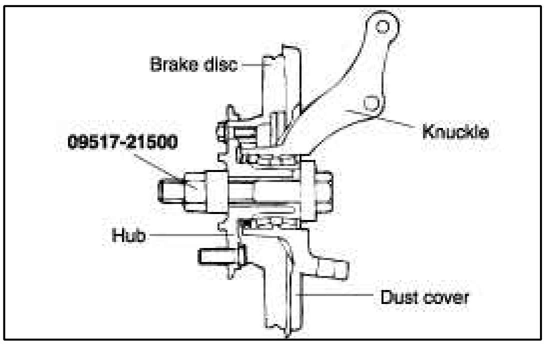

Press
09532-31200A
Wheel bearing
Dust cover

4. Using the Special Tool(09495-33100), press the hub into the knuckle.

> **NOTE**
>
> Do not press on the outer race of the wheel bearing. That will cause damage to the bearing assembly.


09495-33100
Knuckle
Dust cover
Hub

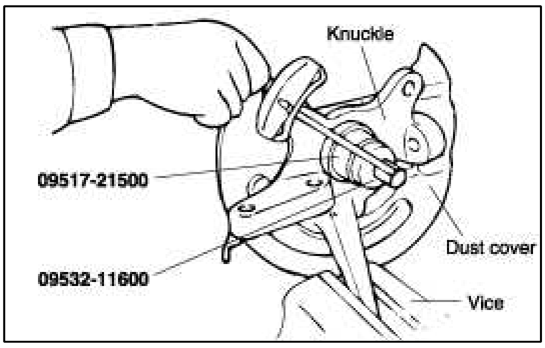
5. Install the brake disc.
6. Tighten the hub to the knuckle to 220~260 Nm (2200~2600 kg·cm, 159~188 lb·ft) with the Special Tool (09517-21500).


Brake disc
09517-21500
Knuckle
Hub
Dust cover

7. Rotate the hub several times to seat bearing.
8. Measure the hub bearing starting torque.

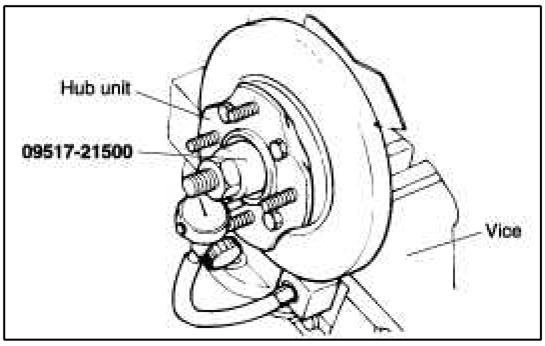
Hub bearing starting torque [Limit] :
1.8 Nm (18 kgf·cm, 1.33 lbf·ft) or less

9. If the starting torque is 0 Ncm (0 lb·ft), measure the hub bearing axial end play.


Knuckle
09517-21500
09532-11600
Dust cover
Vice

10. If the hub bearing axial end play exceeds the limit while the nut is tightened to 220~260 Nm (2200~2600 kg·cm, 159~188 lb·ft), the bearing, hub and knuckle have not been installed correctly. Repeat the disassembly and assembly procedure.

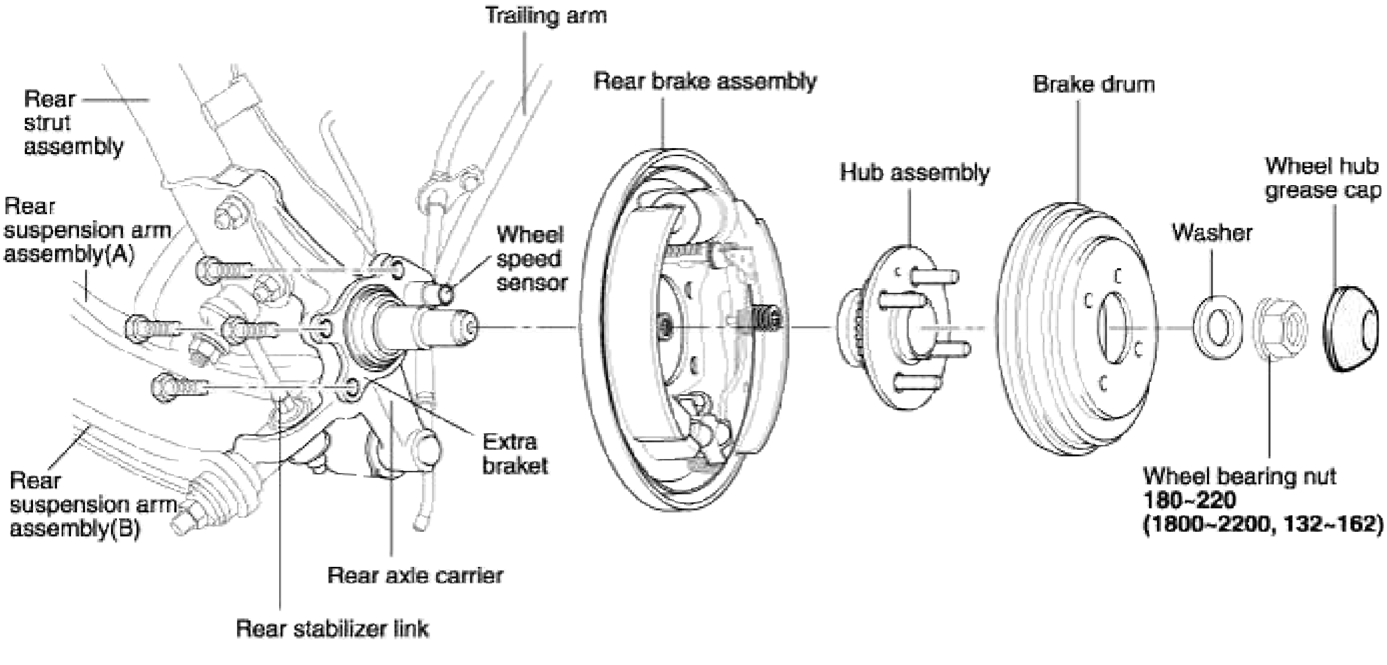
Hub bearing axial end play [Limit] : 0.064 ~ 0.088 mm (0.0025 ~ 0.0035 in.) or less


Hub unit
09517-21500
Vice

11. Remove the Special Tool. (09517-21500)

Driveshaft and axle > Rear Axle Assembly > Rear Hub / Carrier > Components and Components Location

COMPONENTS


Trailing arm
Rear strut assembly
Rear suspension arm assembly(A)
Wheel speed sensor
Rear brake assembly
Hub assembly
Brake drum
Washer
Wheel hub grease cap
Extra braket
Rear suspension arm assembly(B)
Rear axle carrier
Rear stabilizer link
Wheel bearing nut
180~220
(1800~2200, 132~162)

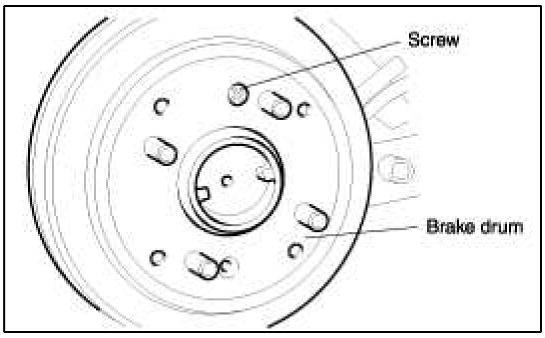
TORQUE : Nm (kgf·cm, lbf·ft)

Driveshaft and axle > Rear Axle Assembly > Rear Hub / Carrier > Repair procedures

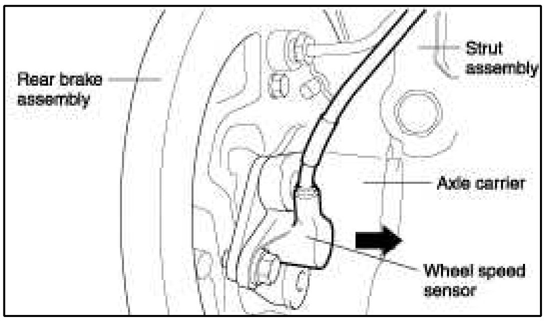
REMOVAL

1. Remove the wheel hub grease cap.
2. Remove the wheel bearing nut and the tongued washer.

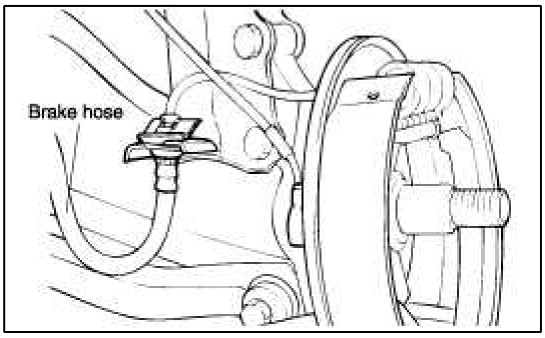
3. Remove the screw from the brake drum.


Screw
Brake drum

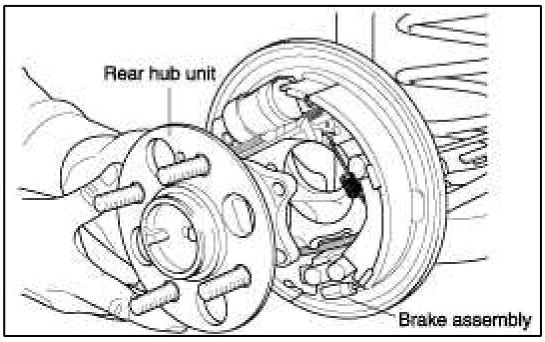
4. Remove the brake drum.
5. Remove the wheel speed sensor from the axle carrier.


Rear brake assembly
Strut assembly
Axle carrier
Wheel speed sensor

6. Remove the brake hose clip and detach the brake hose from the shock absorber.



7. Remove the rear hub unit bearing from the brake assembly.


Rear hub unit
Brake assembly

INSTALLATION

Installation is the reverse of removal.

1. Install the rear hub unit bearing.
2. Assemble the tongued washer and the wheel bearing nut.

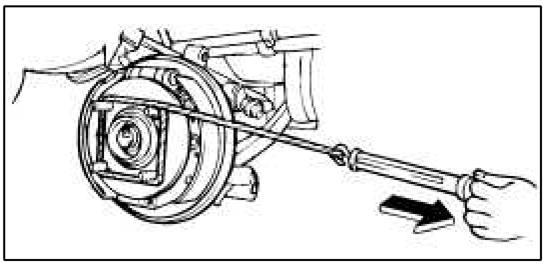
> NOTE
>
> Left and right bearing must be from one manufacturer. Press inner race until it contacts the end of the splines.

3. Hammer the wheel bearing nut for the groove in the carrier.
4. Connect the rear speed sensor.
5. Fix up the brake drum to the rear hub assembly with the screw.
6. Install the wheel hub grease cab.

INSPECTION

1. Check the rear hub bearing for wear or damage.
2. Check the rear tone wheel for chipped teeth.
3. Check the rotating rear hub unit bearing for noise.

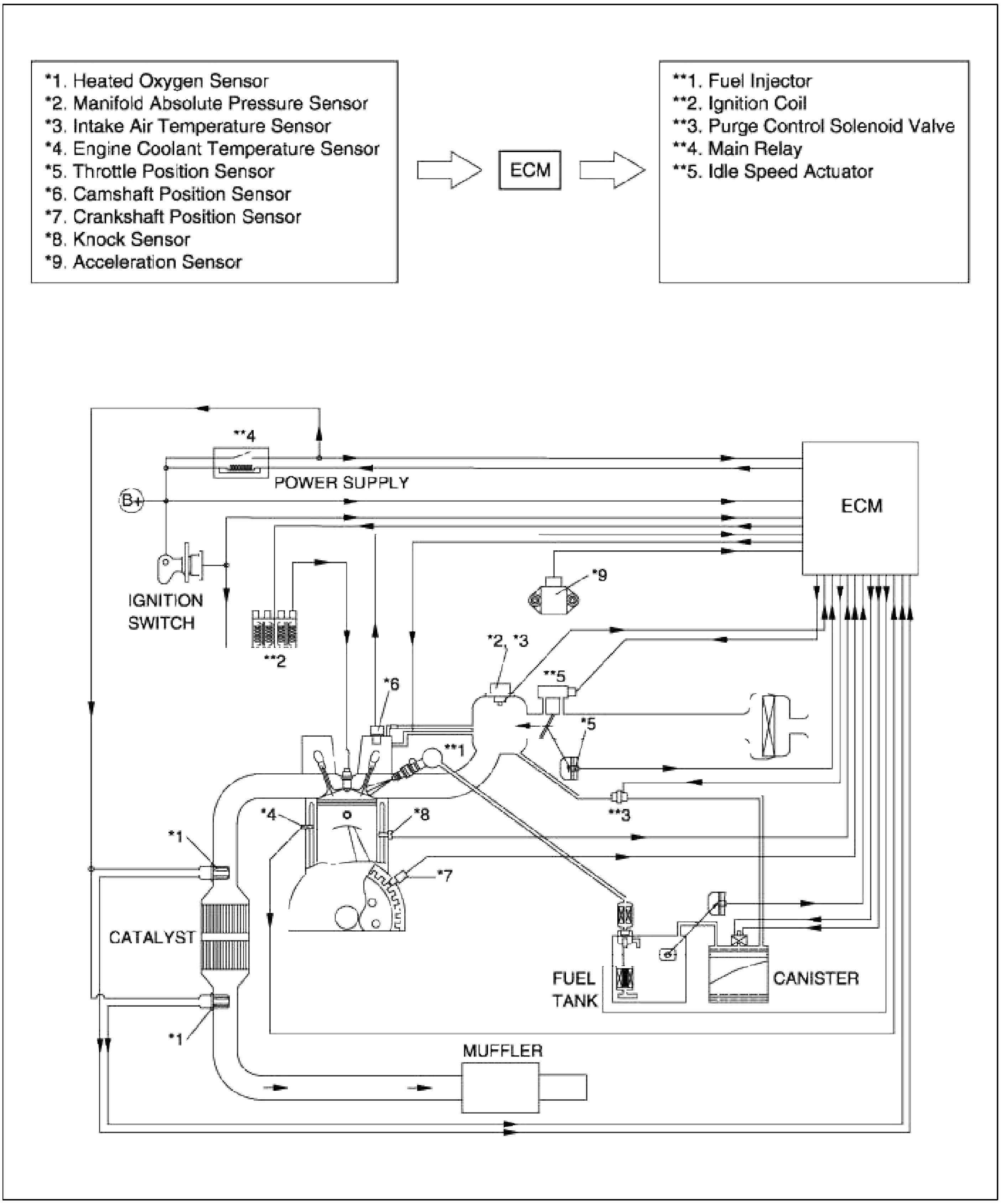
4. Check the hub inner surface for wear.
5. Check the carrier for cracks.
6. Check the rear hub unit bearing starting torque (it should be less than 1.8 Nm (18 kgf·cm, 1.33 lbf·ft)).



ACCENT(LC) > 2002 > G 1.5 SOHC > Emission Control System

Emission Control System > General Information > Schematic Diagrams

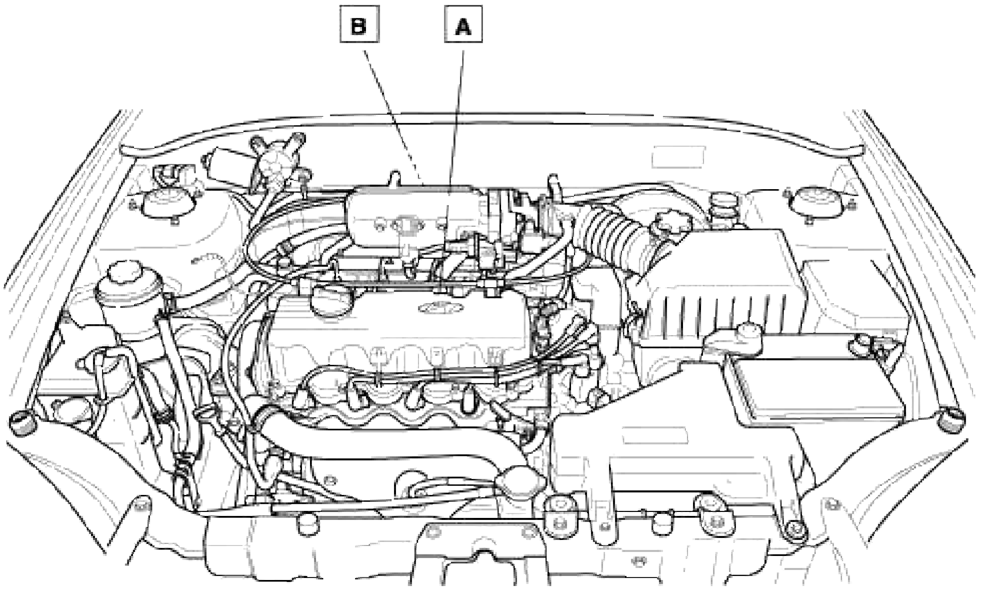
SCHEMATIC DRAWING


*1. Heated Oxygen Sensor
*2. Manifold Absolute Pressure Sensor
*3. Intake Air Temperature Sensor
*4. Engine Coolant Temperature Sensor
*5. Throttle Position Sensor
*6. Camshaft Position Sensor
*7. Crankshaft Position Sensor
*8. Knock Sensor
*9. Acceleration Sensor
ECM
**1. Fuel Injector
**2. Ignition Coil
**3. Purge Control Solenoid Valve
**4. Main Relay
**5. Idle Speed Actuator
**4
POWER SUPPLY
B+
ECM
IGNITION SWITCH
**2
*9
*2, *3
**5
*6
*5
**1
**3
*4
*8
*1
*7
CATALYST
FUEL TANK
CANISTER
*1
MUFFLER

Emission Control System > General Information > Components and Components Location

COMPONENTS

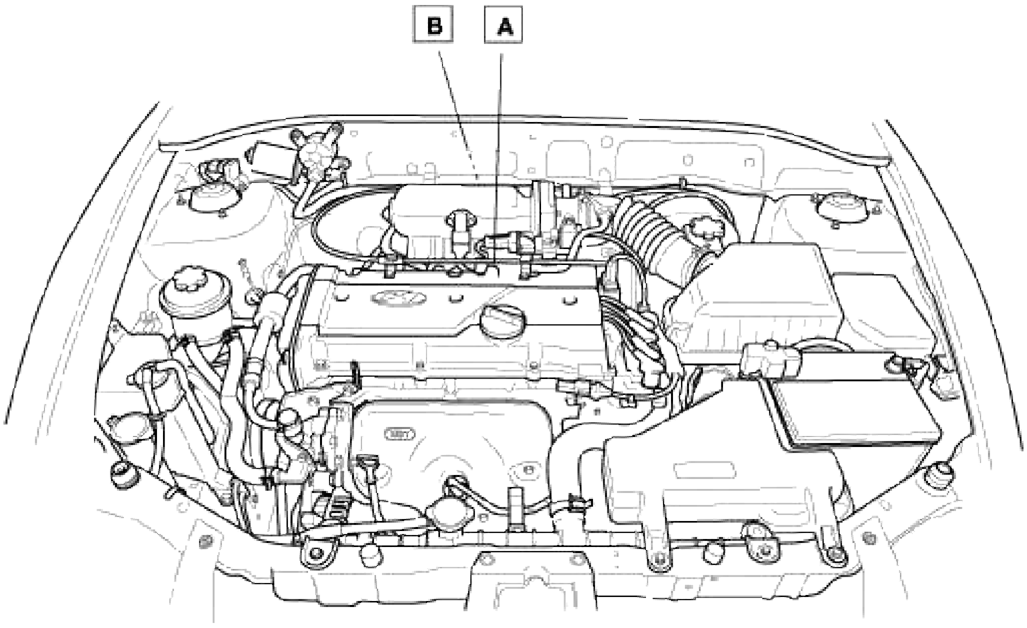
[SOHC]



A Positive Crankcase Ventilation Valve (PCV valve)

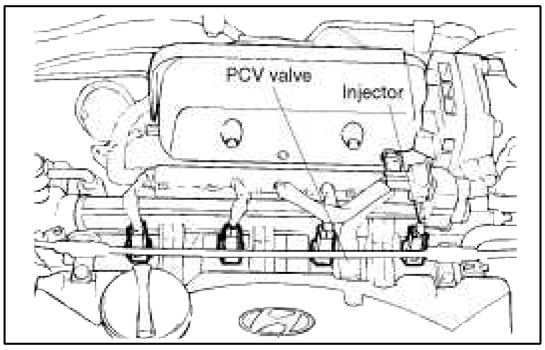
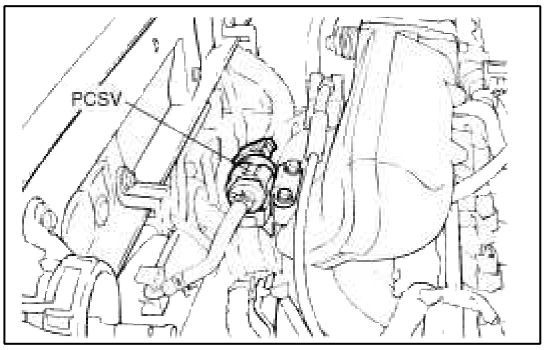
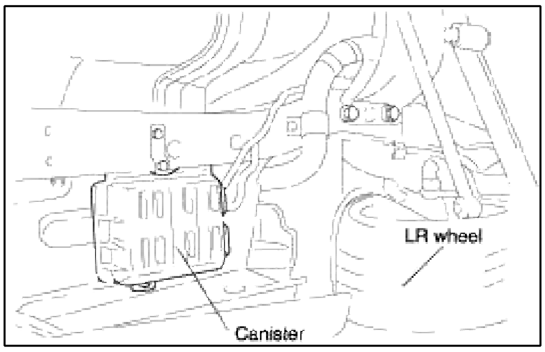
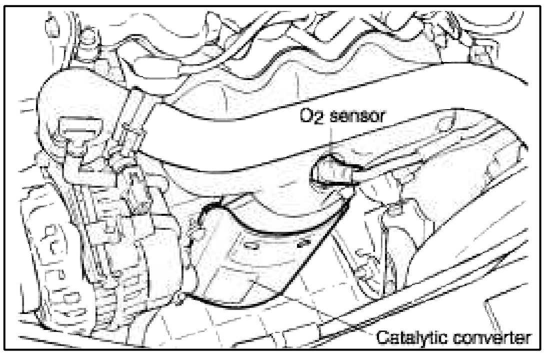
B Purge Control Solenoid Valve (PCSV)

[DOHC]



A Positive Crankcase Ventilation Valve (PCV valve)

B Purge Control Solenoid Valve (PCSV)

A. PCV valve	**B. PCSV**
	
C. Evaporative emission canister	**D. Three way catalytic converter**
	

Emission Control System > General Information > Troubleshooting

TROUBLESHOOTING

Symptom	Probable cause	Remedy
Engine will not start or hard to start	Vacuum hose disconnected or damaged Malfunction of the EVAP Canister Purge Solenoid Valve	Repair or replace Repair or replace
Rough idle or engine stalls	Vacuum hose disconnected or damaged Malfunction of the PCV vavle Malfunction of the evaporative emission canister purge system	Repair or replace Replace Check the system; if there is a problem, check related components parts
Excessive oil consumption	Positive crankcase ventilation line clogged	Check positive crankcase ventilation system

Emission Control System > General Information > Specifications

SPECIFICATIONS

COMPONENTS	FUNCTION	REMARKS
Crankcase Emission System Positive Crankcase Ventilation (PCV)	HC reduction	Variable flow rate type
Evaporative Emission System Evaporative emission canister EVAP canister Purge Solenoid Valve	HC reduction	Duty control solenoid valve
Exhaust Emission System MFI system (Air-fuel mixtrue control device) Three-way catalytic converter	CO, HC, NOx reduction CO, HC, NOx reduction	Heated oxygen sensor feedback type Monolithic type

MFI : Multiport Fuel Injection

EVAP : Evaporative Emission

SERVICE STANDARD

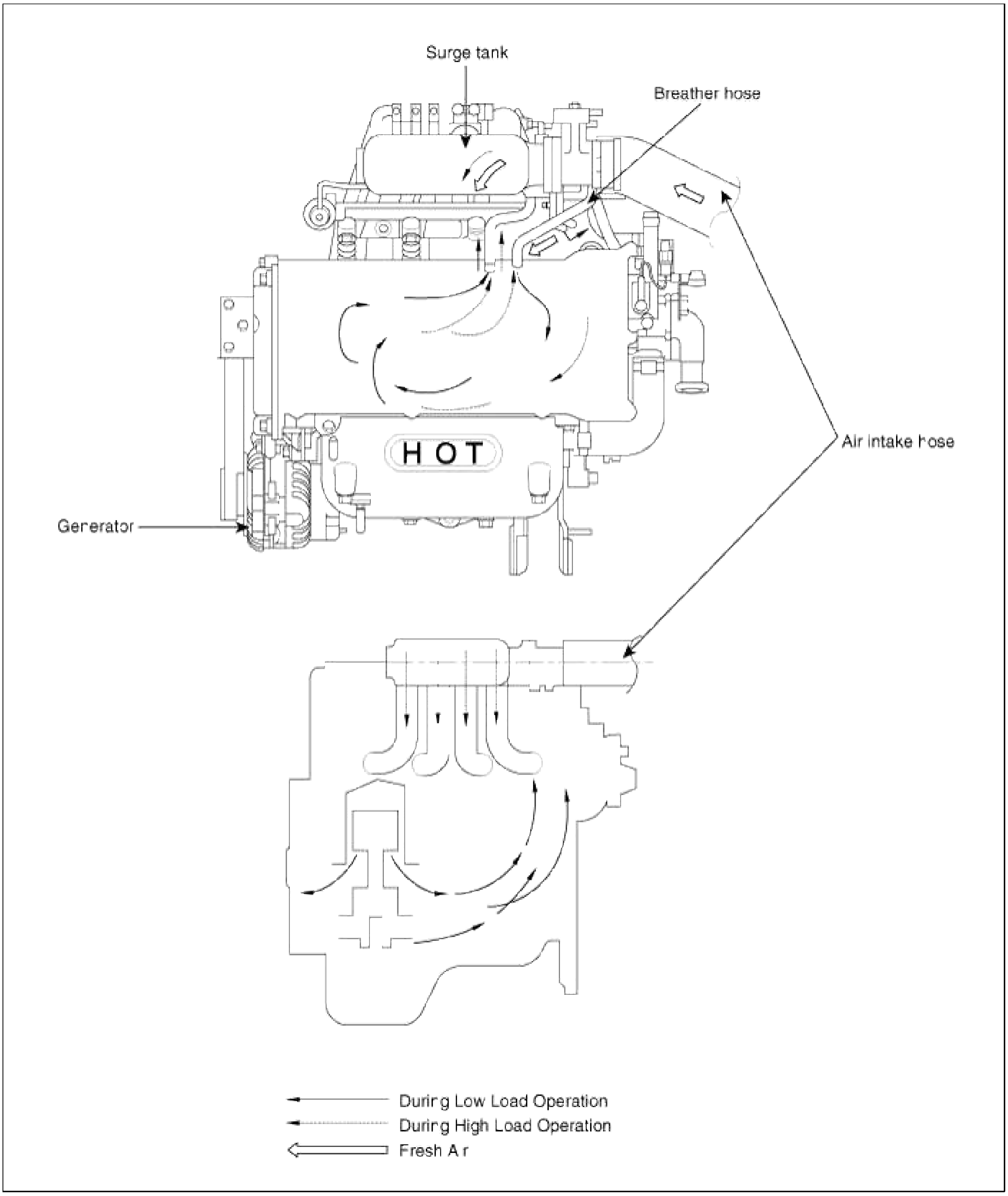
Evaporative emission canister purge solenoid valve Coil resistance	26 Ω [at 20°C (68 °F)]

TIGHTENING TORQUE

	Nm	kg·cm	lb·ft
Positive Crankcase Ventilation Valve	8 ~ 12	80 ~ 120	5.8 ~ 8.7

Emission Control System > Crankcase Emission Control System > Positive Crankcase Ventilation (PCV) Valve > Flow Diagram

COMPONENTS

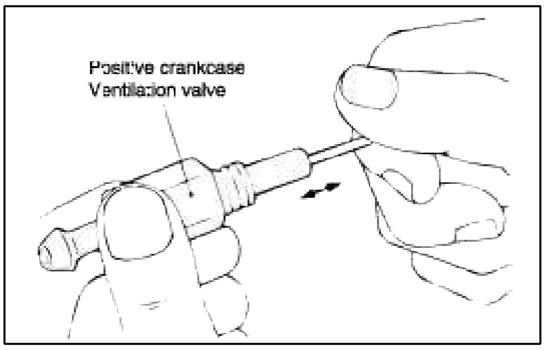

Surge tank
Breather hose
HOT
Air intake hose
Gererator
During Low Load Operation
During High Load Operation
Fresh Air

Emission Control System > Crankcase Emission Control System > Positive Crankcase Ventilation (PCV) Valve > Repair procedures

INSPECTION

1. Remove the PCV valve.
2. Insert a thin stick into the PCV valve from the threaded side to check that the plunger moves.

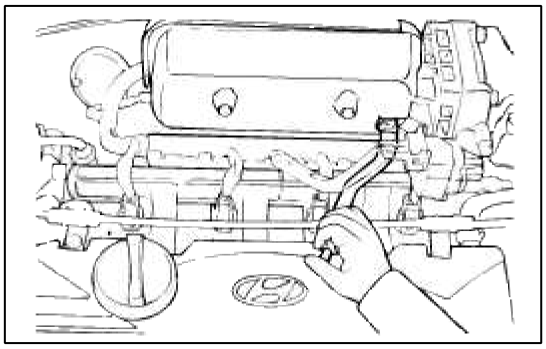
3. If the plunger does not move, the PCV valve is clogged. Clean it or replace.



REMOVAL

1. Disconnect the ventilation hose from the positive crankcase ventilation (PCV) valve. Remove the PCV valve from the rocker cover and reconnect it to the ventilation hose.
2. Run the engine at idle.
   Put a finger on the open end of the PCV valve to verify that the intake manifold vacuum can be felt.

> **NOTE**
>
> The plunger inside the PCV valve will move back and forth.



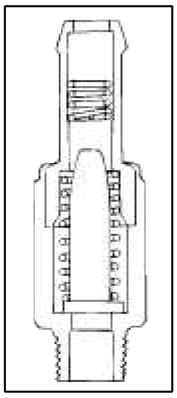
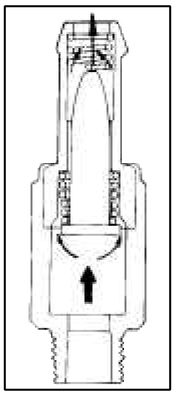
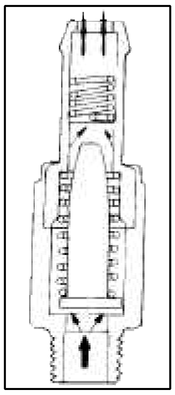
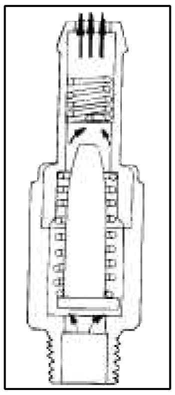
3. If the vacuum is not felt, clean the PCV valve and ventilation hose in cleaning solvent or replace if necessary.

INSTALLATION

PCV valve tightening torque:
8 ~ 12 Nm (80 ~ 120 kg·cm, 5.8 ~ 8.7 lb·ft)

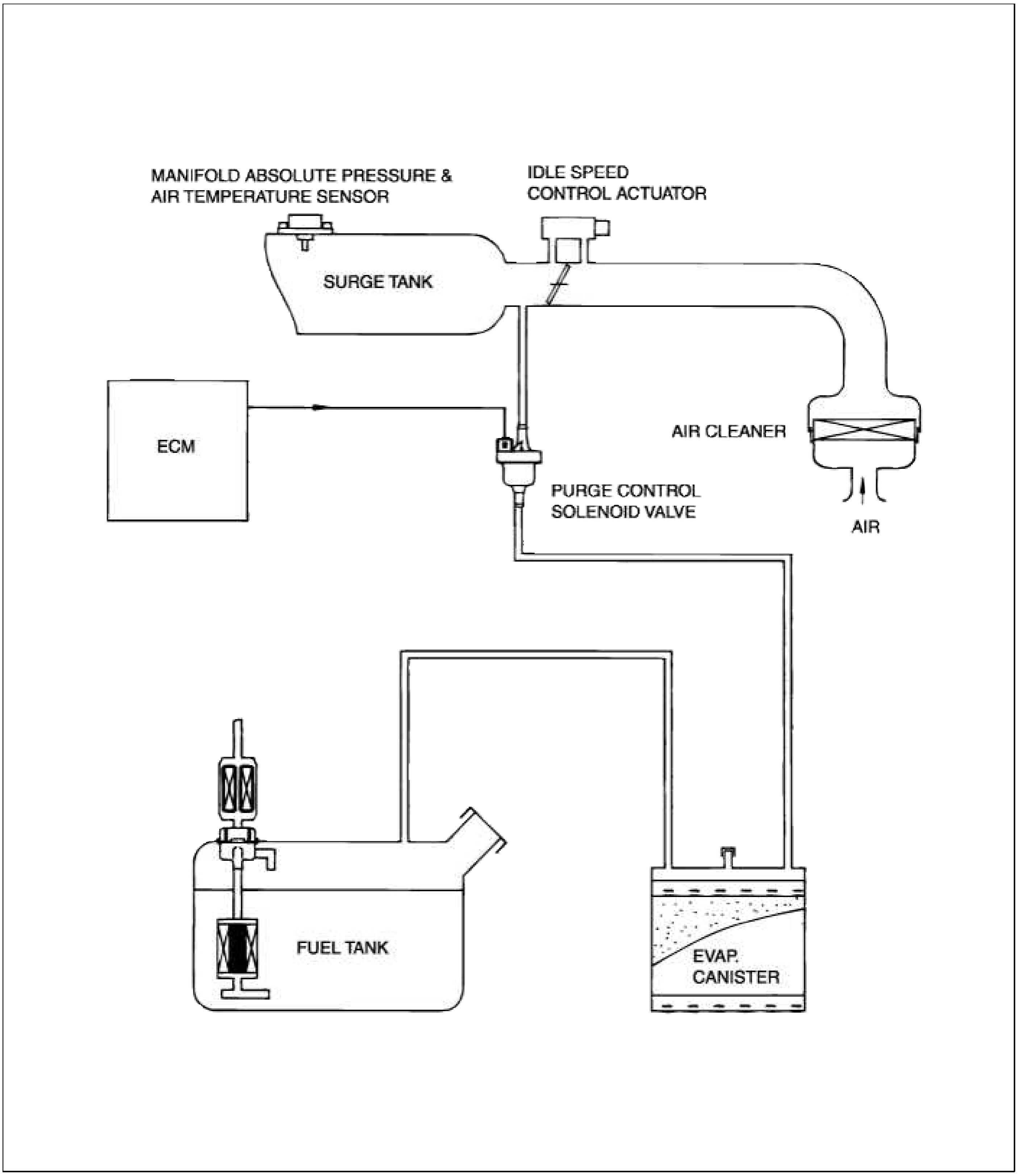
Emission Control System > Crankcase Emission Control System > Description and Operation

OPERATION

Intake manifold side (No vacuum)  Rocker cover side		Intake manifold side (High vacuum)  Rocker cover side	
Engine condition	Not running	Engine condition	Idling or decelerating
PCV valve	Not operating	PCV valve	Fully operating
Vacuum passage	Restricted	Vacuum passage	Small
Intake manifold side (Moderate vacuum)  Rocker cover side		Intake manifold side (Low vacuum)  Rocker cover side	
Engine condition	Normal operation	Engine condition	Accelerating and high load
PCV valve	Properly operating	PCV valve	Slightly operating
Vacuum passage	Large	Vacuum passage	Very large

Emission Control System > Evaporative Emission Control System > Canister > Schematic Diagrams

PURGE CONTROL SYSTEM


MANIFOLD ABSOLUTE PRESSURE &
AIR TEMPERATURE SENSOR
IDLE SPEED
CONTROL ACTUATOR
SURGE TANK
ECM
AIR CLEANER
PURGE CONTROL
SOLENOID VALVE
AIR
FUEL TANK
EVAP.
CANISTER

Emission Control System > Evaporative Emission Control System > Canister > Repair procedures

INSPECTION

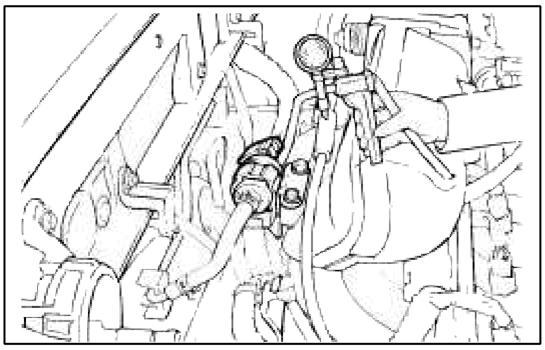
CANISTER PURGE SOLENOID VALVE

NOTE

When disconnecting the vacuum hose, make a mark on it so that it can be reconnected to its original position.

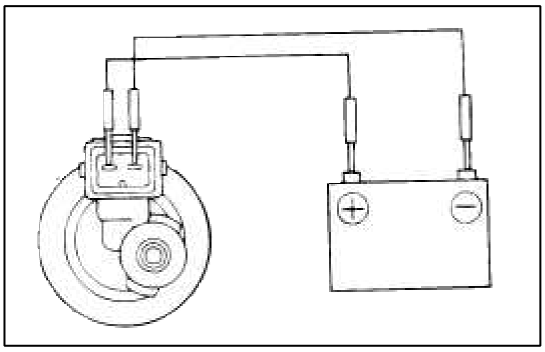
1. Disconnect the vacuum hose from the solenoid valve.
2. Detach the harness connector.

3. Connect a vacuum pump to the nipple where the red striped vacuum hose was connected.

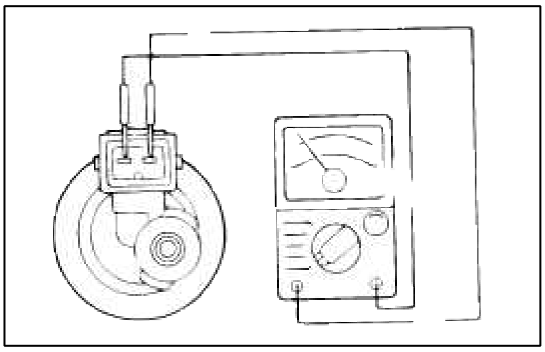


4. Apply vacuum and check when voltage is applied to the evaporative emission canister purge solenoid valve and when the voltage is discontinued.

Battery voltage	Normal condition
When applied	Vacuum is released
When discontinued	Vacuum is maintained

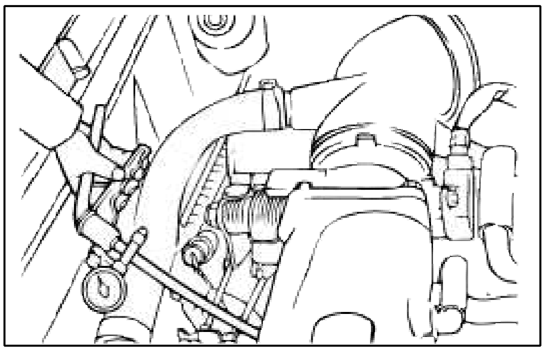


5. Measure the resistance between the terminals of the solenoid valve.



VACUUM HOSE

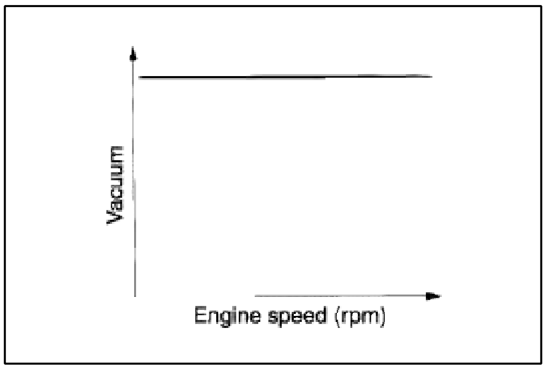
1. Disconnect the vacuum hose from the intake manifold, and connect a hand vacuum pump to the intake manifold port.



Start the engine and check that, vacuum remains fairly constant, while raising the engine speed.

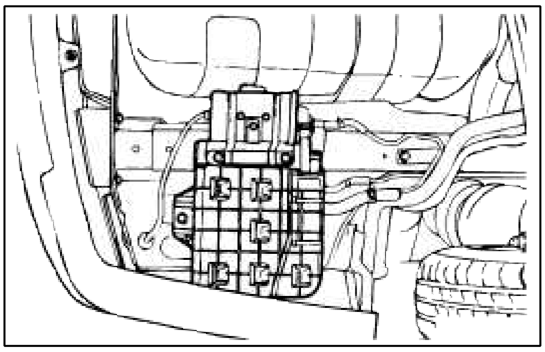
NOTE

If there is no vacuum created, it is possible that the intake manifold port may be clogged and require cleaning.

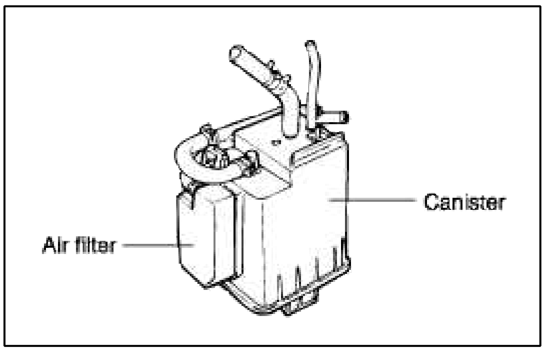


INSPECTION

1. Look for loose connections, sharp bends or damage to the fuel vapor lines.
2. Look for distortion, cracks or fuel leakage.



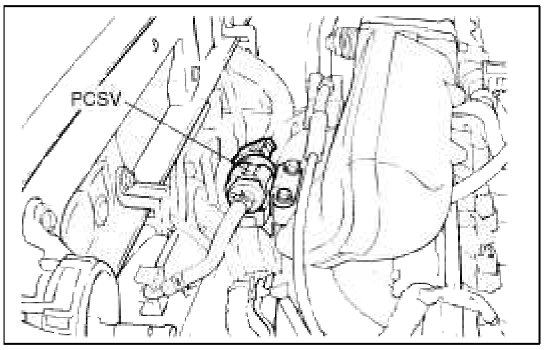
3. After removing the EVAP Canister, inspect for cracks or damage.



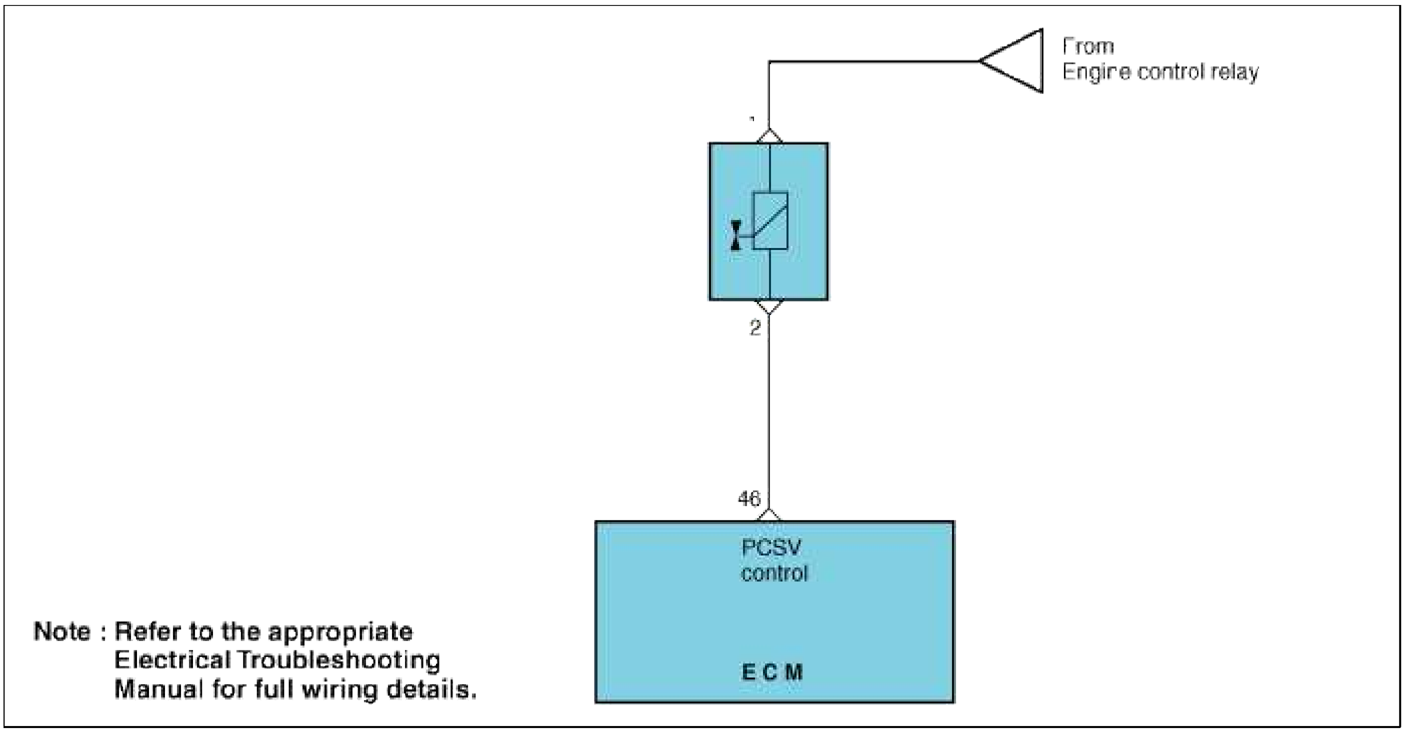
Emission Control System > Evaporative Emission Control System > Purge Control Solenoid Valve (PCSV) > Troubleshooting

PURGE SOLENOID VALVE

The evaporative emission canister purge solenoid valve is a duty control type, which controls the flow of purge air from the evaporative emission canister.



CIRCUIT DIAGRAM

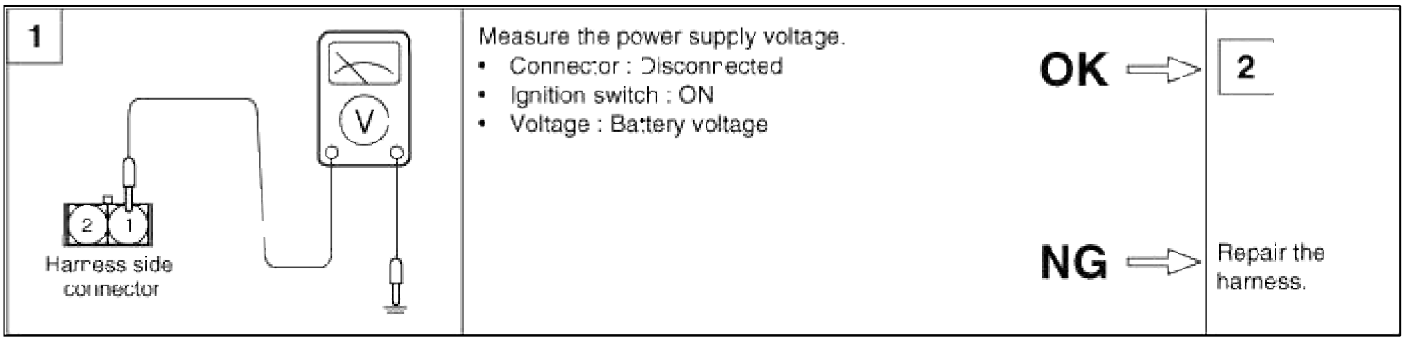

From
Engine control relay
1
2
46
PCSV
control
ECM

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

USING HI-SCAN

Check item	Check condition	HI-SCAN display	Type
Evaporative emission canister purge solenoid valve • Actuator test	Start the engine	Purge valve	Activate

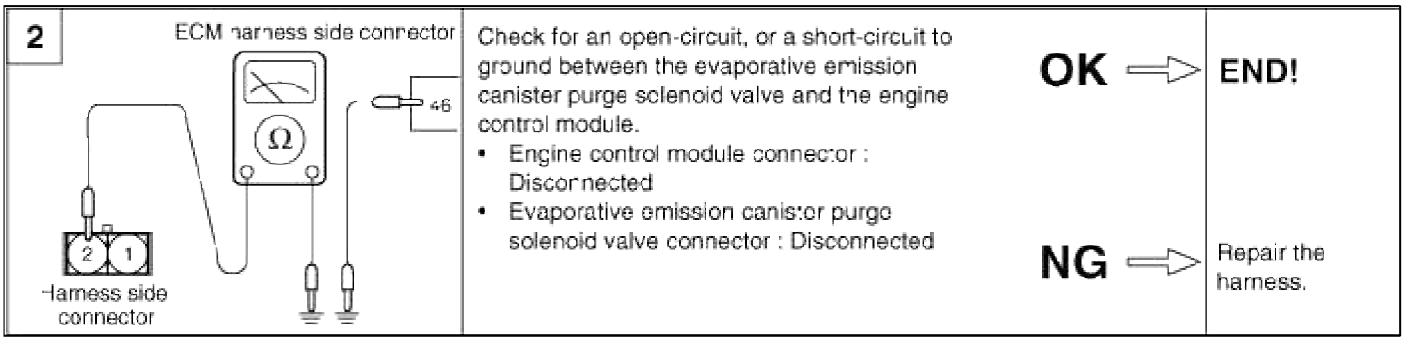
HARNESS INSPECTION PROCEDURES


1
2
1
Harness side connector
V
OK
2
NG

Measure the power supply voltage.

- Connector : Disconnected
- Ignition switch : ON
- Voltage : Battery voltage

Repair the harness.


2
ECM harness side connector
46
Ω
2
1
Harness side connector
OK
END!
NG

Check for an open-circuit, or a short-circuit to ground between the evaporative emission canister purge solenoid valve and the engine control module.

- Engine control module connector : Disconnected
- Evaporative emission canister purge solenoid valve connector : Disconnected

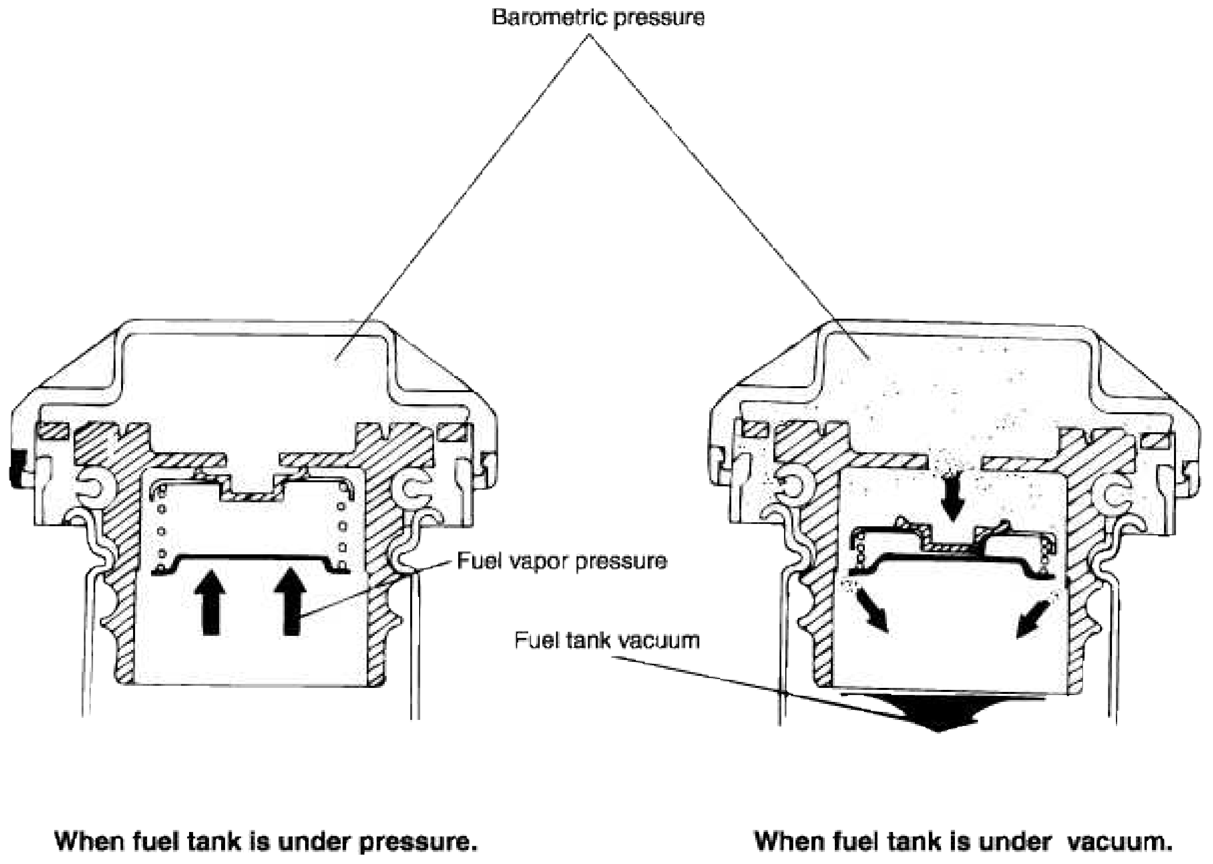
Repair the harness.

ACTUATOR INSPECTION

Refer to GROUP EC-Evaporative Emission System.

Emission Control System > Evaporative Emission Control System > Fuel Filler Cap > Description and Operation

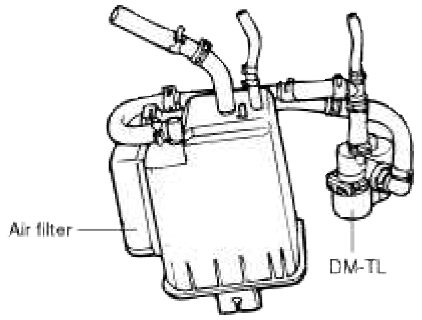
OPERATION

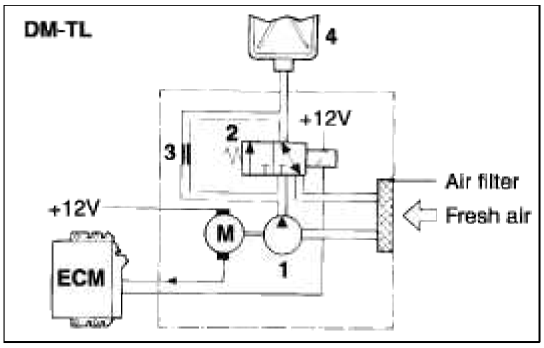

Barometric pressure
Fuel vapor pressure
Fuel tank vacuum
When fuel tank is under pressure.
When fuel tank is under vacuum.

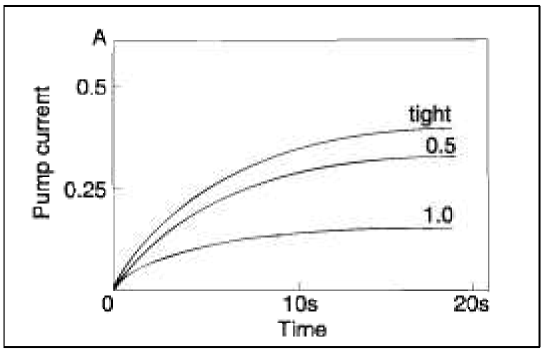
Emission Control System > Evaporative Emission Control System > Diagnosis Module - Tank Leakage (DMTL) > Description and Operation

DM-TL (DIAGNOSIS MODULE-TANK LEAKAGE)

OPERATION


Air filter
DM-TL

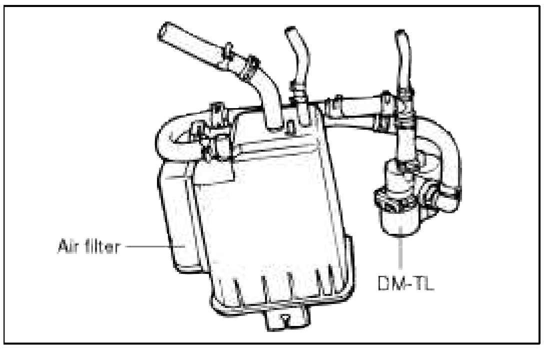

DM-TL
4
+12V
2
3
Air filter
Fresh air
+12V
M
1
ECM



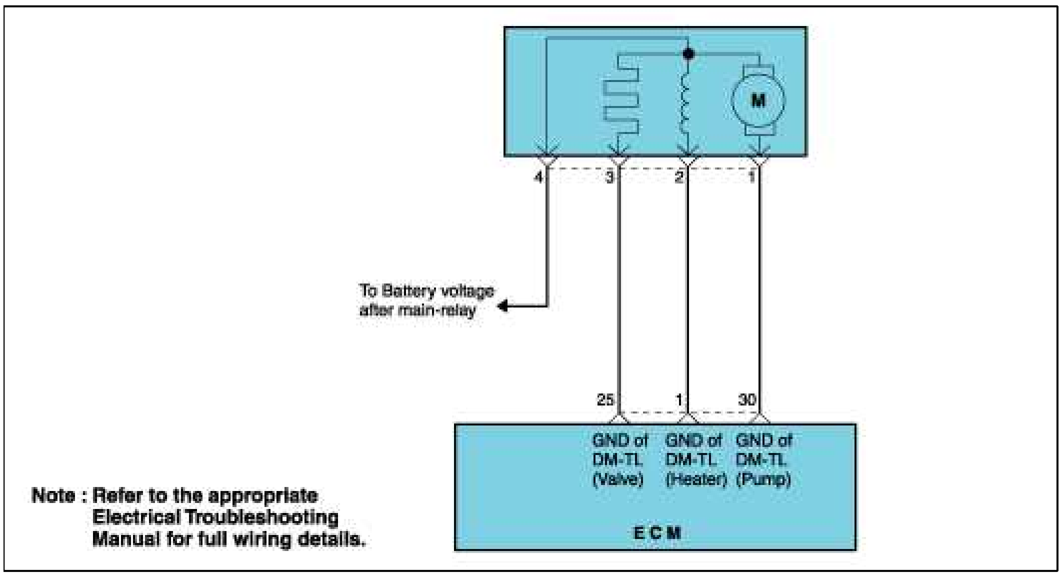
Emission Control System > Evaporative Emission Control System > Diagnosis Module - Tank Leakage (DMTL) > Troubleshooting

DIAGNOSIS MODULE - TANK LEAKAGE (DM-TL)

The diagnosis module comprises an electromechanically driven pump together with a change-over valve and heater.
The engine management system measures the pump's electrical current consumption while pumping air into the canister and fuel tank to check the system's leakage.
If the electrical current consumption is over the threshold value specified before in the memory, this means that there is a tank-system leak.


Air filter
DM-TL

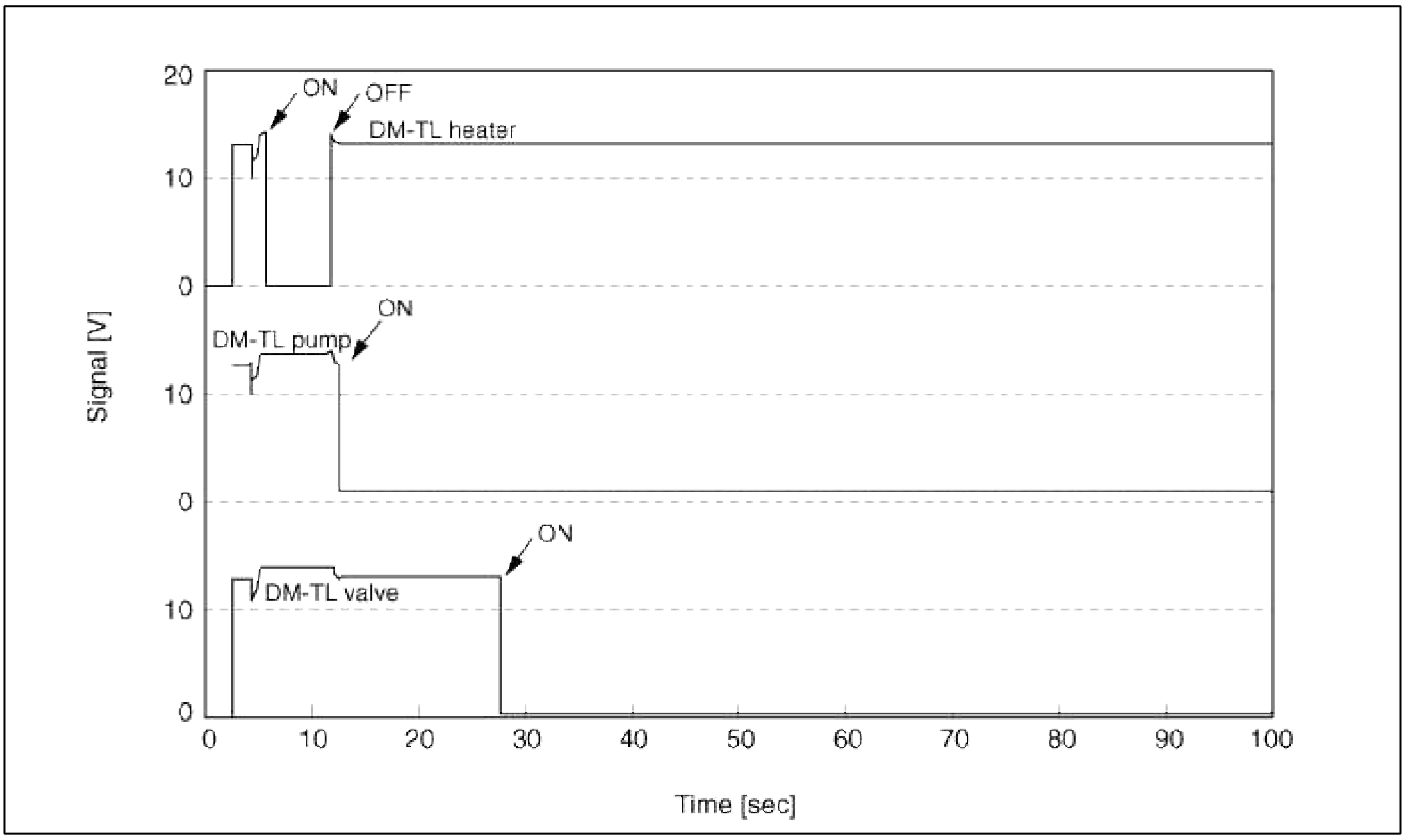
CIRCUIT DIAGRAM


M
4
3
2
1
To Battery voltage after main-relay
25
1
30
GND of DM-TL (Valve)
GND of DM-TL (Heater)
GND of DM-TL (Pump)
ECM

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TROUBLESHOOTING HINTS

1. DM-TL control signal



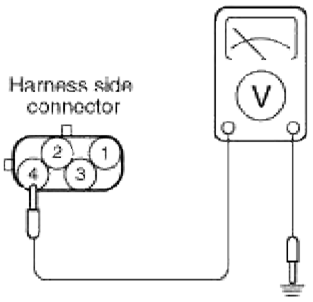
2. DM-TL operating conditions.

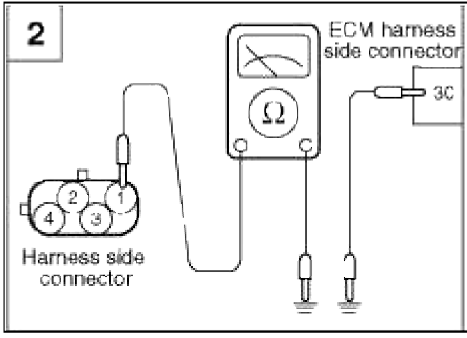
(1) DM-TL monitoring operation starts only after all the conditions below are met.

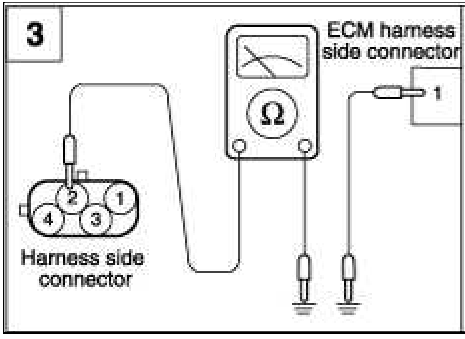
A. Vehicle soaking over 4 hours and 30 minutes.
B. Engine coolant temperature over 2.3°C (36.14°F) when starting.
C. Ambient temperature between 1.5°C (34.7°F) and 40.5°C (104.9°F).
D. 6.4ℓ or more gasoline in the fuel tank.
E. Over 20 minutes driving after starting.
F. During Air Bag is not working.

(2) And also you can check the DM-TL operation with simulation mode of HI-SCAN.

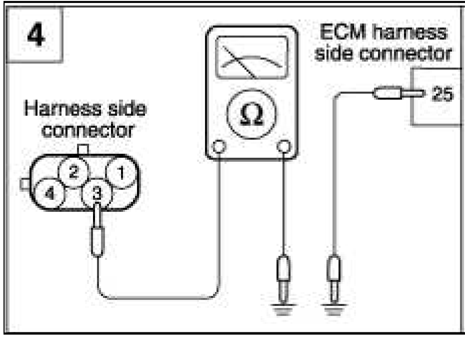
HARNESS INSPECTION PROCEDURES

1		Measure the power supply voltage of the DM-TL. • Connector : Disconnected • Ignition switch : ON • Voltage (V) : Battery voltage	**OK** ⇨	2
			NG ⇨	Repair the harness.

2	 ECM harness side connector 30 Ω 1 2 3 4 Harness side connector	Check for an open-circuit, or short-circuit to ground between the ECM and DM-TL. • DM-TL connector : Disconnected • ECM connector : Disconnected	**OK** ⇨	3
			NG ⇨	Repair the harness.

3 	Check for an open-circuit, or short-circuit to ground between the ECM and DM-TL. • DM-TL connector : Disconnected • ECM connector : Disconnected	**OK** ⇨	4
		NG ⇨	Repair the harness.

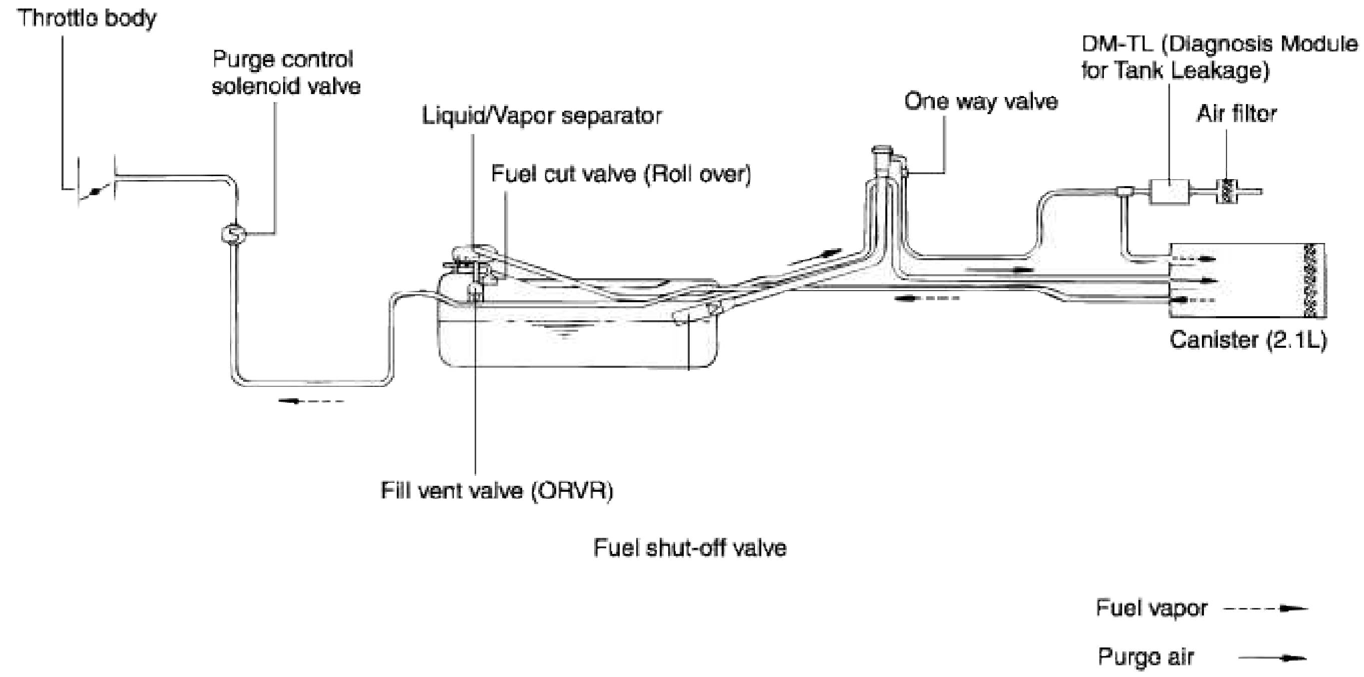
ECM harness side connector
1
Ω
1
2
3
4
Harness side connector

4 	Check for an open-circuit, or short-circuit to ground between the ECM and DM-TL. • DM-TL connector : Disconnected • ECM connector : Disconnected	**OK** ⇨	END!
		NG ⇨	Repair the harness.

ECM harness side connector
25
Ω
Harness side connector
1
2
3
4

Emission Control System > Evaporative Emission Control System > Description and Operation

DESCRIPTION



Throttle body
Purge control solenoid valve
Liquid/Vapor separator
Fuel cut valve (Roll over)
One way valve
DM-TL (Diagnosis Module for Tank Leakage)
Air filter
Canister (2.1L)
Fill vent valve (ORVR)
Fuel shut-off valve
Fuel vapor
Purge air

Emission Control System > Exhaust Emission Control System > Description and Operation

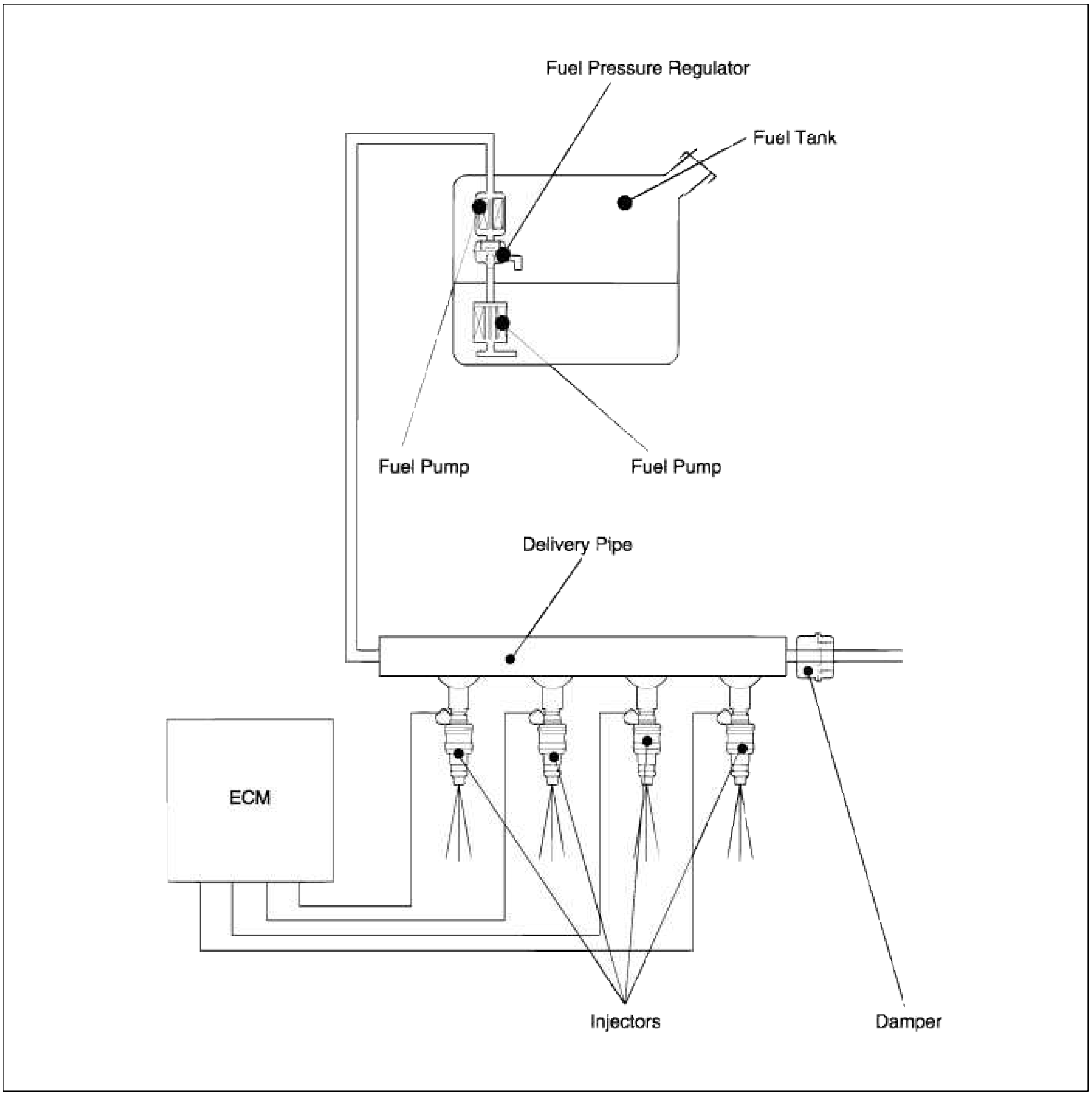
OPERATION

AIR/FUEL MIXTURE CONTROL SYSTEM [MULTIPORT FUEL INJECTION (MFI) SYSTEM]

The MFI system is a system which uses the signals from the heated oxygen sensor to activate and control the fuel injectors.

Precisely regulating the air/fuel mixture ratio and reducing emissions.

1. Open Loop air/fuel ratio is controlled by information programmed into the ECM.
2. Closed Loop air/fuel ratio is adjusted by the ECM based on information supplied by the oxygen sensor.



Emission Control System > Troubleshooting > P0420

[P0420]

DTC	Diagnostic item
P0420	Catalyst System Efficiency Below Threshold (Bank 1)

DESCRIPTION

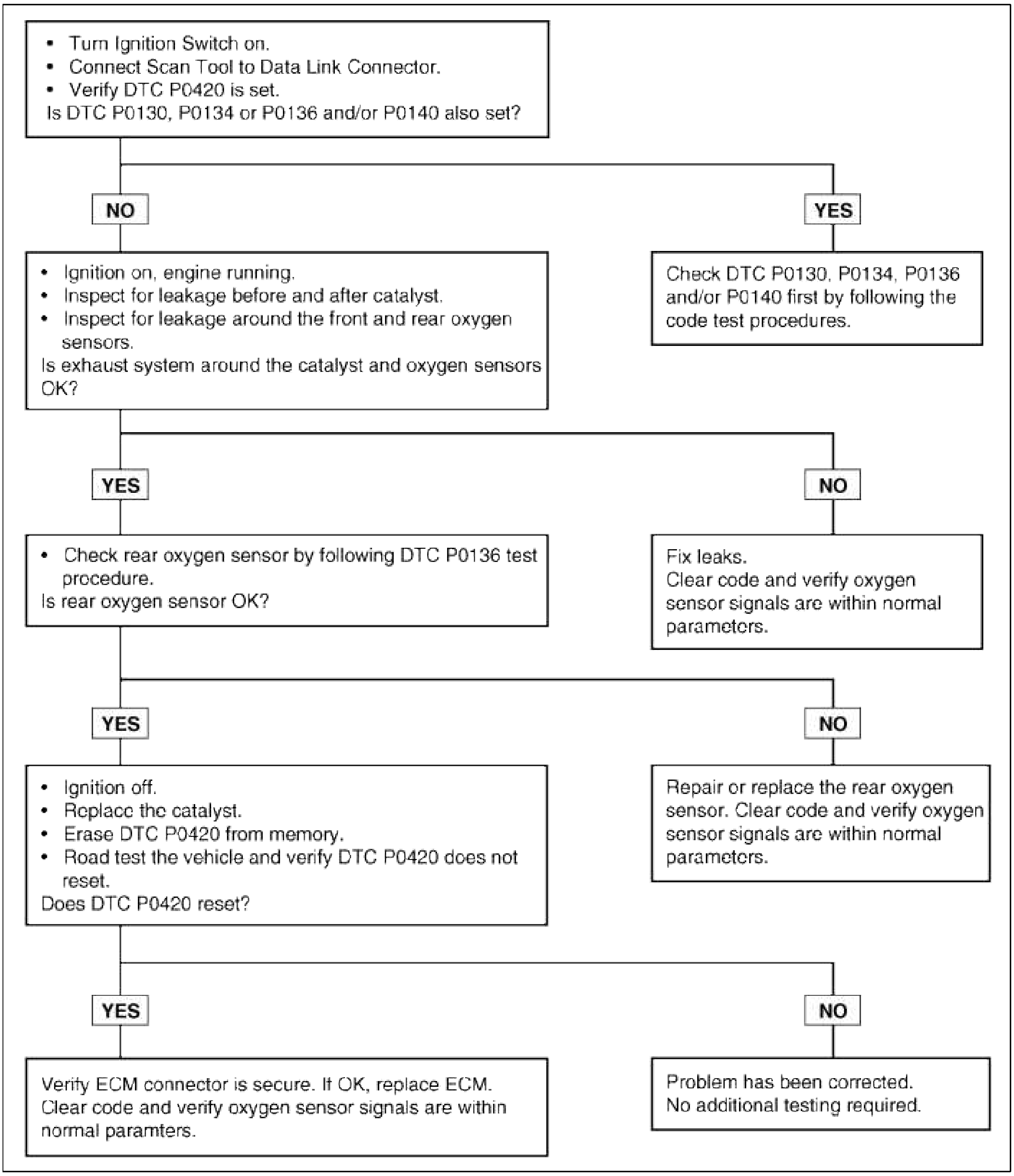
The catalyst's efficiency is demonstrated in its ability to oxidize CO and HC emissions. The Engine Control Module (ECM) compares the output signals of the front and rear oxygen sensors to determine whether the output of the rear sensor is beginning to match the output of the front oxygen sensor. As the catalyst wears, the rear oxygen sensor's signal trace begins to match the front oxygen sensor's signal trace. That is because the catalyst becomes saturated with oxygen and cannot use the oxygen to convert HC and CO into H2O and CO2 with the same efficiency as when it was new. A completely worn catalyst shows a 100% match between front and rear sensor outputs.

FAILURE CONDITION

- The ECM is operating in closed loop.
- The engine speed is between 1800 and 3200 RPM.
- The catalyst temperature is above 702°F (372°C).

- The canister purge function is greater than 0.9.
- The vehicle is not shifting gears.
- The engine load is between 1.4 milliseconds and 4.5 milliseconds.

TEST PROCEDURE



- Turn Ignition Switch on.
- Connect Scan Tool to Data Link Connector.
- Verify DTC P0420 is set.

Is DTC P0130, P0134 or P0136 and/or P0140 also set?

- Ignition on, engine running.
- Inspect for leakage before and after catalyst.
- Inspect for leakage around the front and rear oxygen sensors.

Is exhaust system around the catalyst and oxygen sensors OK?

Check DTC P0130, P0134, P0136 and/or P0140 first by following the code test procedures.

- Check rear oxygen sensor by following DTC P0136 test procedure.

Is rear oxygen sensor OK?

Fix leaks.
Clear code and verify oxygen sensor signals are within normal parameters.

- Ignition off.
- Replace the catalyst.
- Erase DTC P0420 from memory.
- Road test the vehicle and verify DTC P0420 does not reset.

Does DTC P0420 reset?

Repair or replace the rear oxygen sensor. Clear code and verify oxygen sensor signals are within normal parameters.

Verify ECM connector is secure. If OK, replace ECM. Clear code and verify oxygen sensor signals are within normal paramters.

Problem has been corrected.
No additional testing required.

Emission Control System > Troubleshooting > P0444

[P0444/P0445]

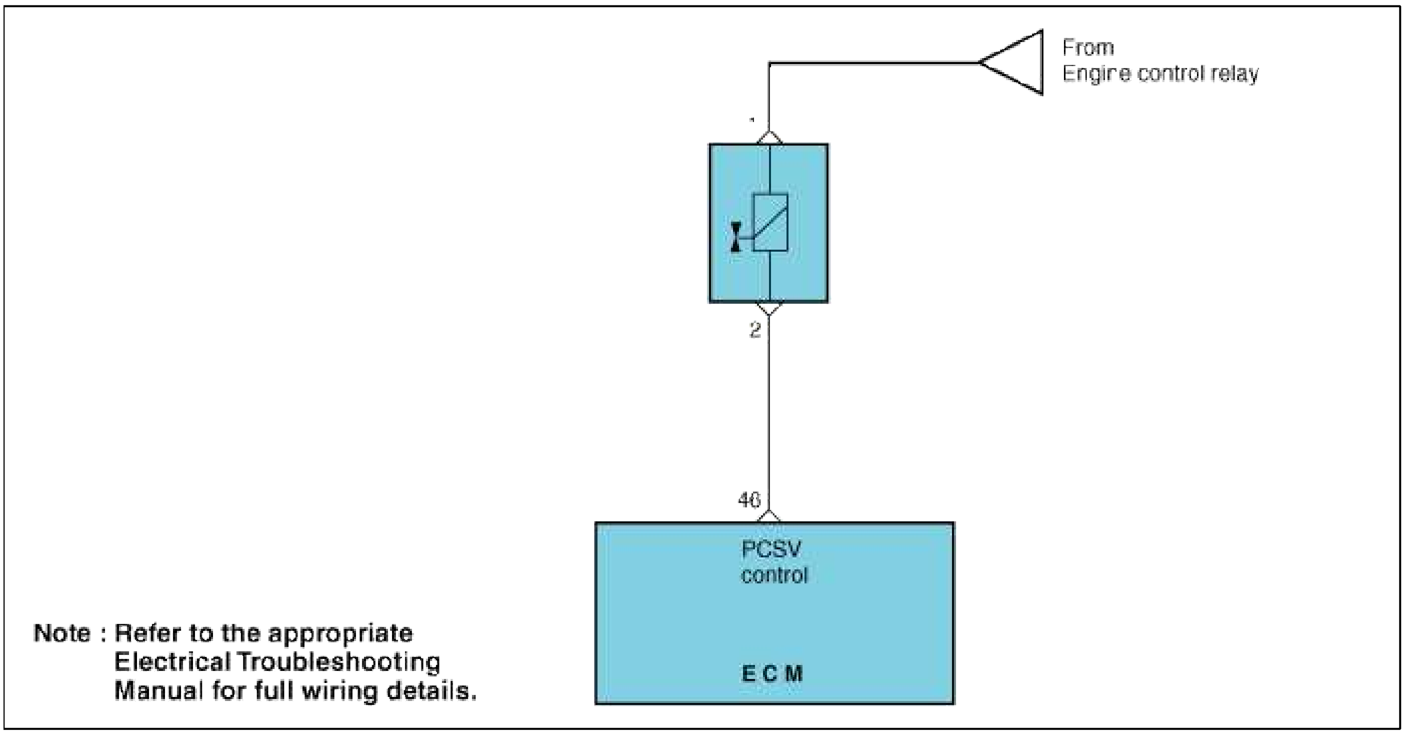
DTC	Diagnostic item
P0444 P0445	Evap. Emission Ctrl. System - Purge Ctrl. Valve Circuit Open Evap. Emission Ctrl. System - Purge Ctrl. Valve Circuit Shorted

DESCRIPTION

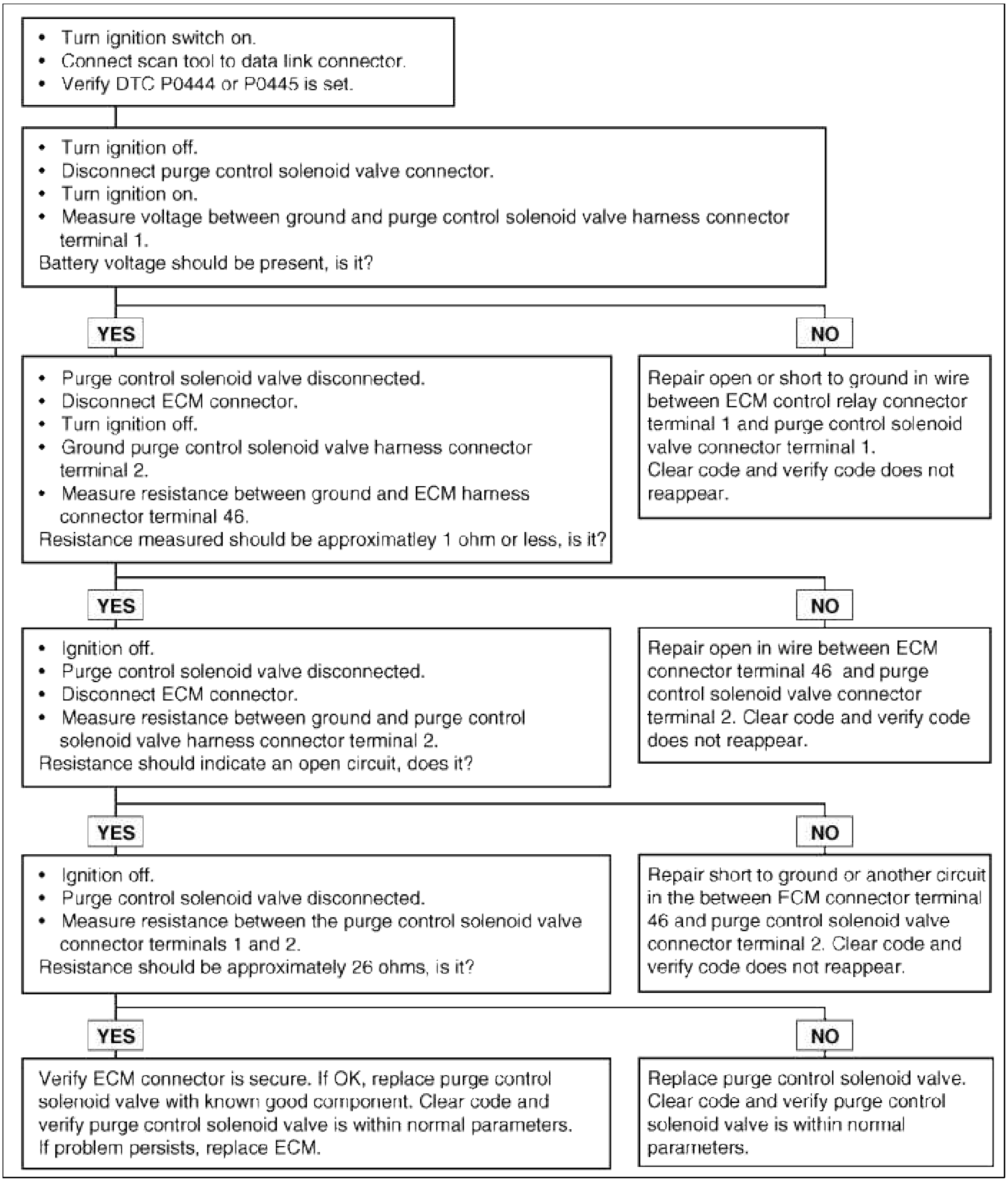
The purge control solenoid valve is part of the evaporative emission control system. The solenoid controls purge air from the evaporative emission canister.

FAILURE CONDITIONS

CIRCUIT DIAGRAM


From
Engine control relay
1
2
46
PCSV
control
E C M
Note : Refer to the appropriate
Electrical Troubleshooting
Manual for full wiring details.

TEST PROCEDURE



- Turn ignition switch on.
- Connect scan tool to data link connector.
- Verify DTC P0444 or P0445 is set.

- Turn ignition off.
- Disconnect purge control solenoid valve connector.
- Turn ignition on.
- Measure voltage between ground and purge control solenoid valve harness connector terminal 1.

Battery voltage should be present, is it?

YES

- Purge control solenoid valve disconnected.
- Disconnect ECM connector.
- Turn ignition off.
- Ground purge control solenoid valve harness connector terminal 2.
- Measure resistance between ground and ECM harness connector terminal 46.

Resistance measured should be approximatley 1 ohm or less, is it?

NO

Repair open or short to ground in wire between ECM control relay connector terminal 1 and purge control solenoid valve connector terminal 1.
Clear code and verify code does not reappear.

YES

- Ignition off.
- Purge control solenoid valve disconnected.
- Disconnect ECM connector.
- Measure resistance between ground and purge control solenoid valve harness connector terminal 2.

Resistance should indicate an open circuit, does it?

NO

Repair open in wire between ECM connector terminal 46 and purge control solenoid valve connector terminal 2. Clear code and verify code does not reappear.

YES

- Ignition off.
- Purge control solenoid valve disconnected.
- Measure resistance between the purge control solenoid valve connector terminals 1 and 2.

Resistance should be approximately 26 ohms, is it?

NO

Repair short to ground or another circuit in the between FCM connector terminal 46 and purge control solenoid valve connector terminal 2. Clear code and verify code does not reappear.

YES

Verify ECM connector is secure. If OK, replace purge control solenoid valve with known good component. Clear code and verify purge control solenoid valve is within normal parameters. If problem persists, replace ECM.

NO

Replace purge control solenoid valve. Clear code and verify purge control solenoid valve is within normal parameters.

Emission Control System > Troubleshooting > P0445

[P0444/P0445]

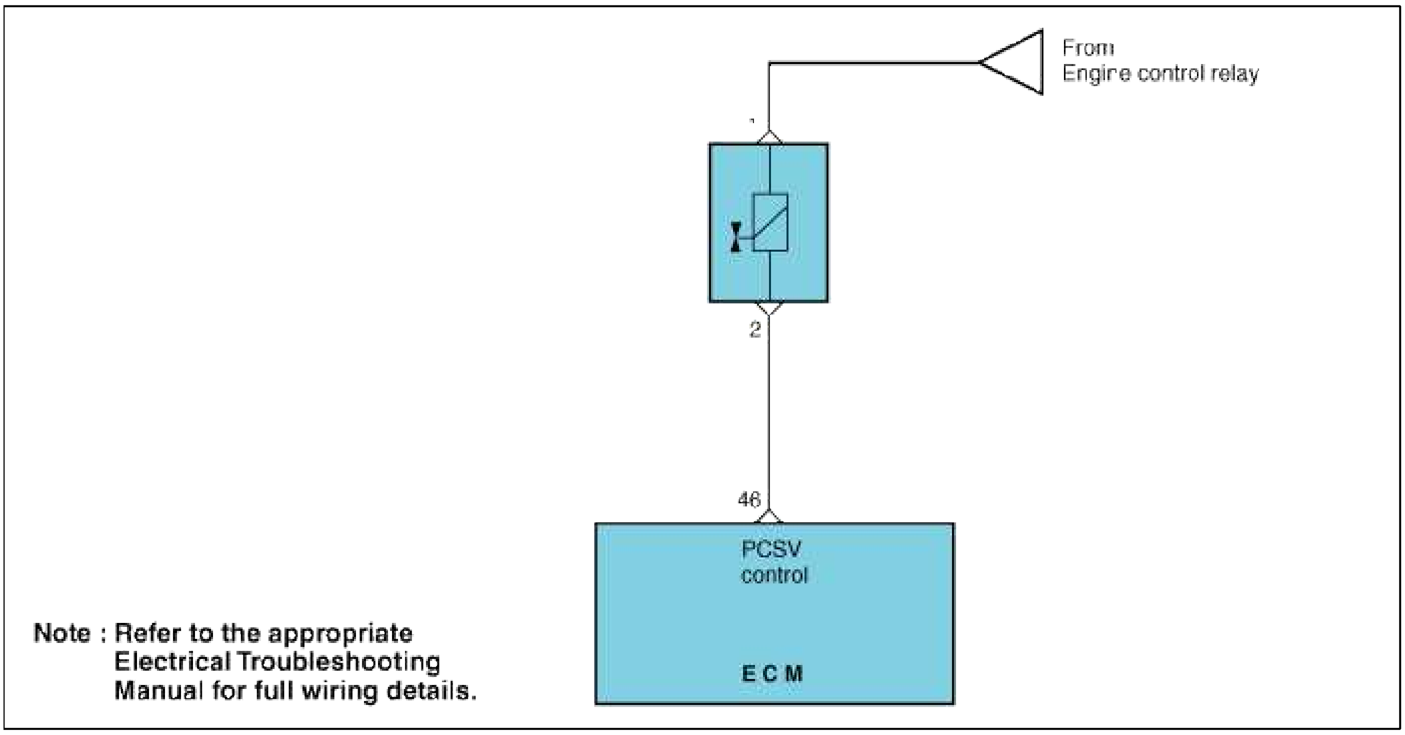
DTC	Diagnostic item
P0444 P0445	Evap. Emission Ctrl. System - Purge Ctrl. Valve Circuit Open Evap. Emission Ctrl. System - Purge Ctrl. Valve Circuit Shorted

DESCRIPTION

The purge control solenoid valve is part of the evaporative emission control system. The solenoid controls purge air from the evaporative emission canister.

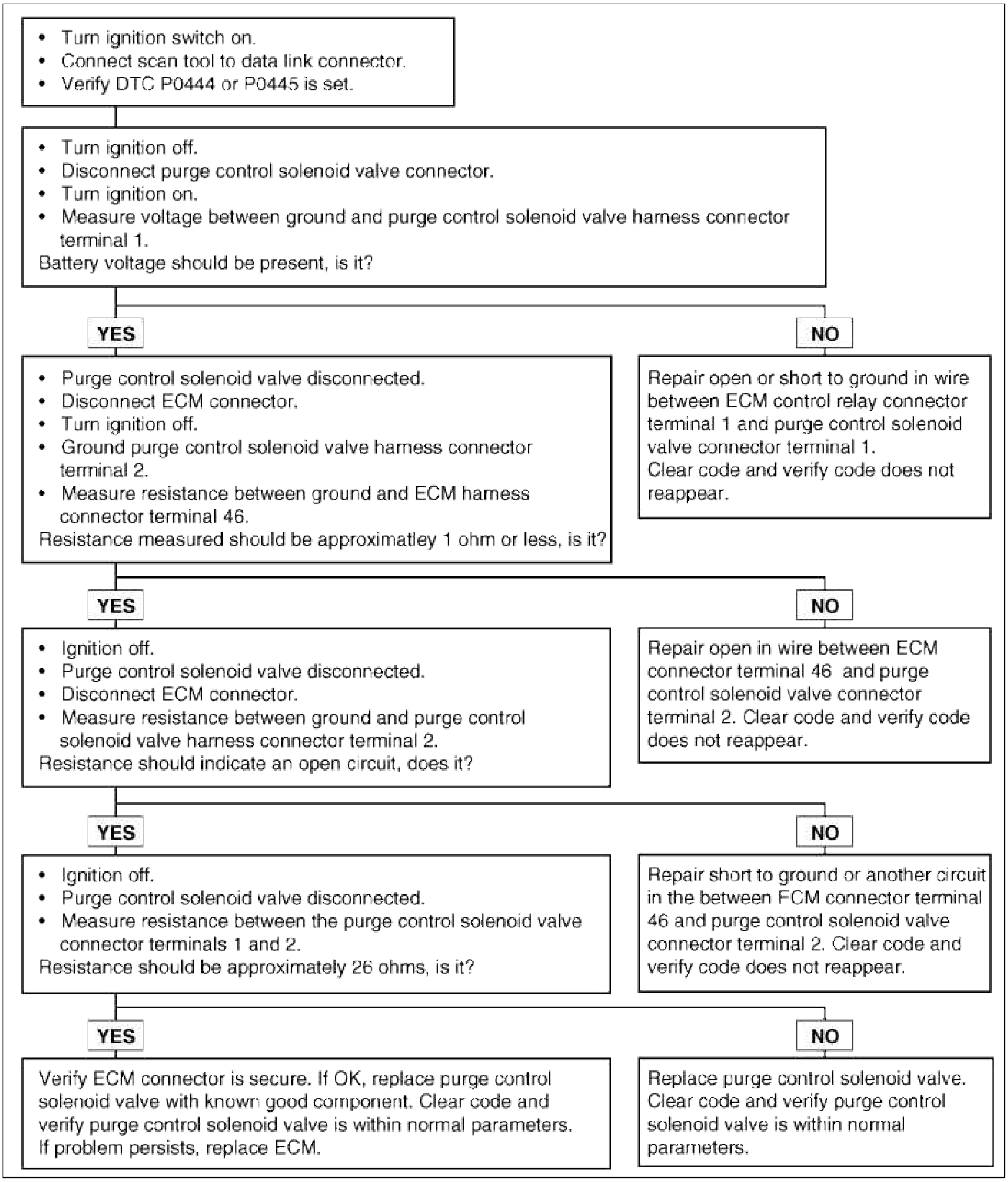
FAILURE CONDITIONS

CIRCUIT DIAGRAM


From
Engine control relay
1
2
46
PCSV
control
E C M

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn ignition switch on.
- Connect scan tool to data link connector.
- Verify DTC P0444 or P0445 is set.

- Turn ignition off.
- Disconnect purge control solenoid valve connector.
- Turn ignition on.
- Measure voltage between ground and purge control solenoid valve harness connector terminal 1.

Battery voltage should be present, is it?

YES

- Purge control solenoid valve disconnected.
- Disconnect ECM connector.
- Turn ignition off.
- Ground purge control solenoid valve harness connector terminal 2.
- Measure resistance between ground and ECM harness connector terminal 46.

Resistance measured should be approximatley 1 ohm or less, is it?

NO

Repair open or short to ground in wire between ECM control relay connector terminal 1 and purge control solenoid valve connector terminal 1.
Clear code and verify code does not reappear.

YES

- Ignition off.
- Purge control solenoid valve disconnected.
- Disconnect ECM connector.
- Measure resistance between ground and purge control solenoid valve harness connector terminal 2.

Resistance should indicate an open circuit, does it?

NO

Repair open in wire between ECM connector terminal 46 and purge control solenoid valve connector terminal 2. Clear code and verify code does not reappear.

YES

- Ignition off.
- Purge control solenoid valve disconnected.
- Measure resistance between the purge control solenoid valve connector terminals 1 and 2.

Resistance should be approximately 26 ohms, is it?

NO

Repair short to ground or another circuit in the between FCM connector terminal 46 and purge control solenoid valve connector terminal 2. Clear code and verify code does not reappear.

YES

Verify ECM connector is secure. If OK, replace purge control solenoid valve with known good component. Clear code and verify purge control solenoid valve is within normal parameters. If problem persists, replace ECM.

NO

Replace purge control solenoid valve. Clear code and verify purge control solenoid valve is within normal parameters.

ACCENT(LC) > 2002 > G 1.5 SOHC > Engine Electrical System

Engine Electrical System > General Information > Troubleshooting

TROUBLESHOOTING

IGNITION SYSTEM

Trouble symptom	Probable cause	Remedy
Engine will not start or is hard to start (Cranks OK)	Ignition lock switch faulty Ignition coil faulty Power transistor faulty Spark plugs faulty Ignition wiring disconnected or broken Spark plugs faulty	Replace ignition lock switch Inspect ignition coil Inspect power transistor Replace plugs Inspect wiring Replace plugs
Rough idle or stalls	Ignition wiring faulty Ignition coil faulty Spark plug cable faulty	Inspect wiring Replace ignition coil Replace spark plug cable
Engine hesitates/poor acceleration	Spark plugs faulty Ignition wiring faulty	Replace plugs Inspect ignition coil and wires
Poor mileage	Spark plugs faulty	Replace plugs

CHARGING SYSTEM

Trouble symptom	Probable cause	Remedy
Charging warning indicator does not light with ignition switch "ON" and engine off	Fuse blown Light burned out Wiring connection loose Electronic voltage regulator faulty	Check fuses Replace light Tighten loose connections Replace voltage regulator
Charging warning indicator does not go out with engine running (Battery requires frequent recharging)	Drive belt loose or worn Battery cables loose, corroded or worn Fuse blown Fusible link blown Electronic voltage regulator or generator faulty Wiring faulty	Adjust tension or replace drive belt Repair or replace cables Check fuses Replace fusible link Test generator Repair wiring
Engine hesitates/poor acceleration Overcharge	Drive belt loose or worn Wiring connection loose or open circuit Fusible link blown Poor grounding Electronic voltage regulator or generator faulty Faulty battery Electronic voltage regulator faulty Voltage sensing wire faulty	Adjust tension or replace drive belt Tighten loose connection or repair wiring Replace fusible link Repair Test generator, if faulty, repair or replace Replace battery Replace voltage regulator Repair wire

STARTING SYSTEM

Trouble symptom	Probable cause	Remedy
Engine will not crank	Battery discharged Battery cables loose, corroded or worn out Transaxle range switch faulty (Vehicle with automatic transaxle only) Fusible link blown Starter motor faulty Ignition switch faulty Ignition lock switch faulty	Charge or replace battery Repair or replace cables Adjust or replace switch Replace fusible link Repair starter motor Replace ignition switch Replace ignition lock switch
Engine cranks slowly	Battery discharged Battery cables loose, corroded or worn out Starter motor faulty	Charge or replace battery Repair or replace cables Repair starter motor
Starter keeps running	Starter motor faulty Ignition switch faulty	Repair starter motor Replace ignition switch
Starter spins but engine will not crank	Short in wiring Pinion gear teeth broken or starter motor faulty Ring gear teeth broken	Repair wiring Repair starter motor Replace flywheel ring gear or torque converter

Engine Electrical System > General Information > Specifications

SPECIFICATIONS

IGNITION COIL

	All engines
Type Primary coil resistance Secondary coil resistance	Mold dual coil 0.87Ω ± 10% 13.0kΩ ± 15%

SPARK PLUG

	All engines		
Type	Unleaded	NGK	BKR5ES-II
		Champion	RC10TC4
Plug gap mm(in)	Unleaded	1.0 ~ 1.1 (0.039 ~ 0.043)	

STARTER

	All engines
Type Rated output Rated time No-load characteristics Terminal voltage Amperage Maximum speed No. of pinion teeth Pinion gap mm(in)	Direct drive type 12V 0.9kW 30 sec. 11.5V 60A 5,500 rpm 8 0.5 ~ 2 (0.0197 ~ 0.079)

GENERATOR

	All engines
Type	Battery voltage sensing
Rated output	13.5V, 90A
Voltage regulator	Electronic built-in type
Regulator setting voltage	14.55 ± 0.2V
Temperature compensation	-10 ± 3mV/°C

BATTERY

Type Ampere hours (5HR) Cold cranking [at -17.8°C (0°F)] Reserve capacity Specific gravity [at 25°C (77°F)]	MF55AH 44A 500A 85 min. 1,280 ± 0.01

NOTE

- COLD CRANKING AMPERAGE is the amperage that the battery can delivery for 30 seconds and maintain a terminal voltage of 7.2 volts or greater at a specified temperature.
- RESERVE CAPACITY RATING is the amount of time a battery can deliver 25A and maintain a minimum terminal voltage of 10.5 volts at 26.7°C (80°F).

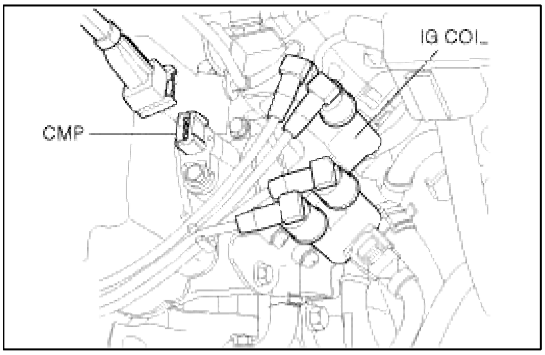
TIGHTENING TORQUE

Items	Nm	kg·cm	lb·ft
Generator terminal (B+)	5 ~ 7	50 ~ 70	3.6 ~ 5.1
Starter motor terminal (B+)	10 ~ 12	100 ~ 120	7.3 ~ 8.8
Battery terminal	4 ~ 6	40 ~ 60	2.9 ~ 4.3
Spark plug	20 ~ 30	200 ~ 300	15 ~ 22

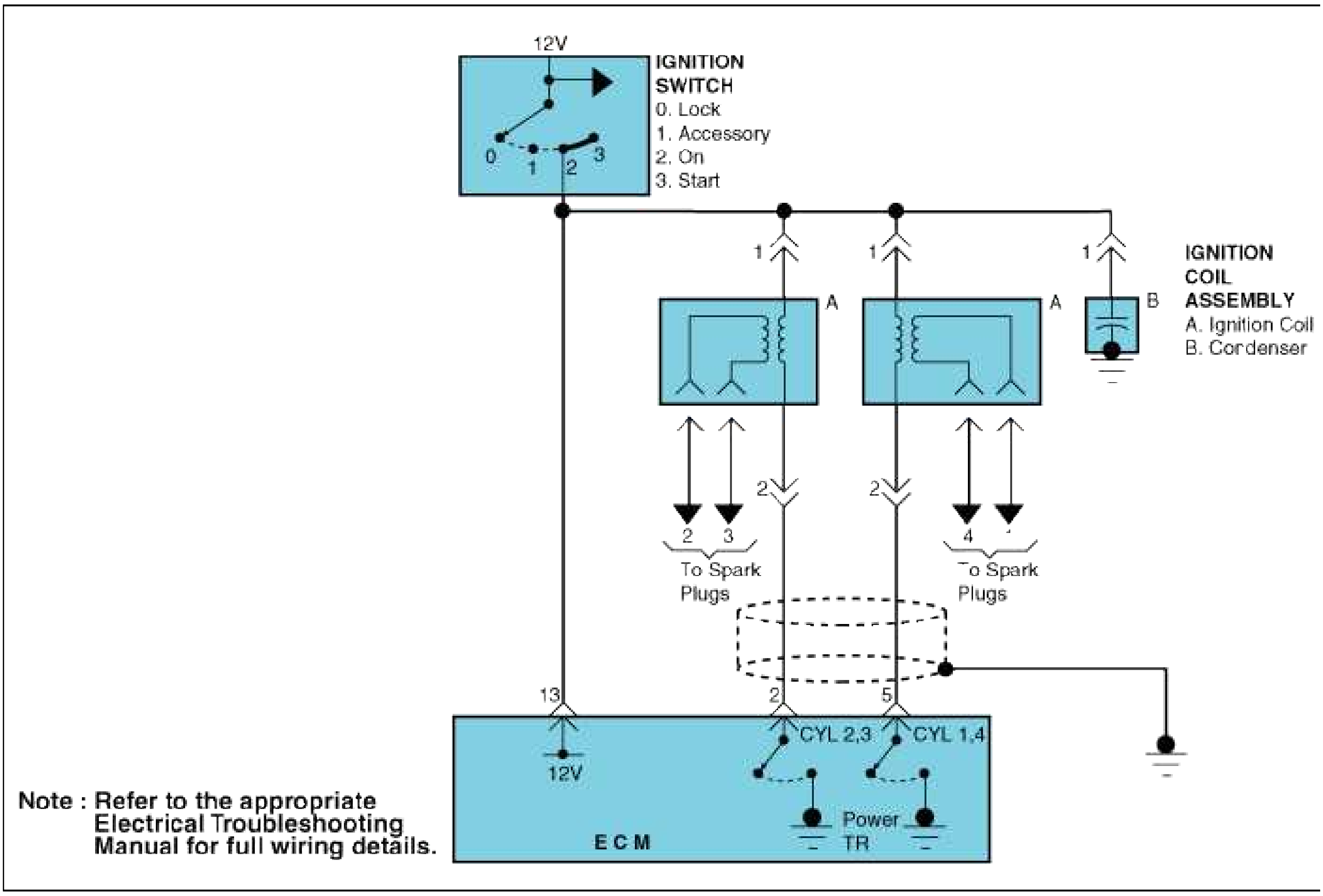
Engine Electrical System > Ignition System > Ignition Coil > Troubleshooting

IGNITION COIL

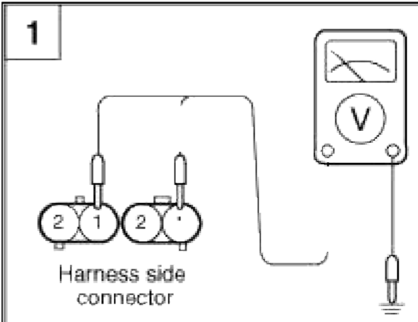
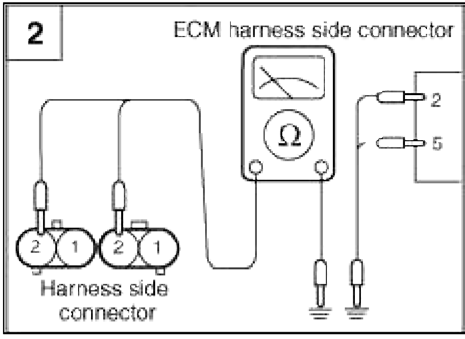
When the ignition power transistor is turned ON by a signal from the ECM, the ECM sends a signal to the ignition coil, then the primary current is shut off and a high voltage is induced in the secondary coil.



CIRCUIT DIAGRAM


12V
IGNITION
SWITCH
0. Lock
1. Accessory
2. On
3. Start
0
1
2
3
1
1
1
A
A
B
IGNITION
COIL
ASSEMBLY
A. Ignition Coil
B. Condenser
2
2
2
3
To Spark
Plugs
4
To Spark
Plugs
13
2
5
CYL 2,3
CYL 1,4
12V
Power
TR
E C M
Note : Refer to the appropriate
Electrical Troubleshooting
Manual for full wiring details.

HARNESS INSPECTION PROCEDURES

1		Measure the power supply voltage of the ignition coil. • Connector : Disconnected • Ignition switch : ON • Voltage (V) : Battery voltage	**OK** ⇨	**2**
			NG ⇨	Repair the harness.
2		Check for an open-circuit, or a short-circuit to ground between the ignition coil and the engine control module. • Engine control module connector: Disconnected • Power transistor connector: Disconnected	**OK** ⇨	**END!**
			NG ⇨	Repair the harness.

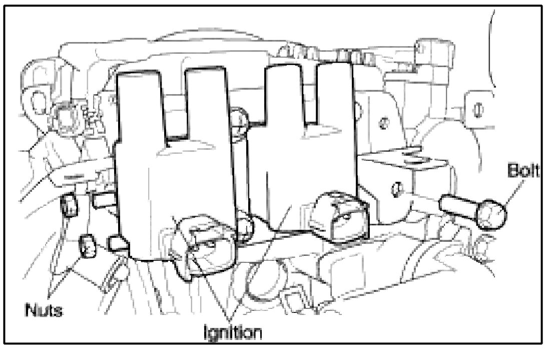
V
2
1
2
Harness side connector

ECM harness side connector
Ω
2
5
2
1
2
1
Harness side connector

Engine Electrical System > Ignition System > Ignition Coil > Repair procedures

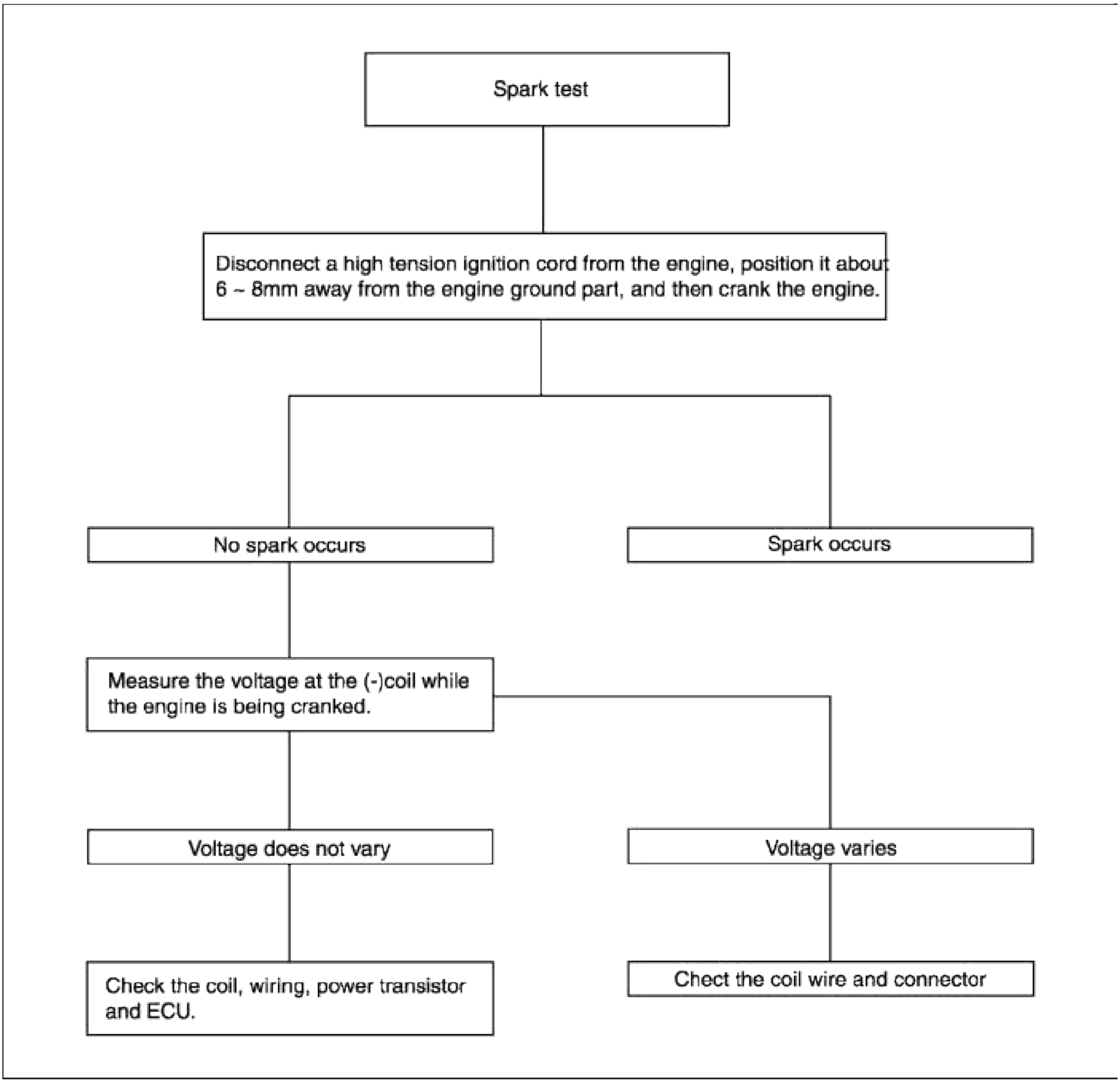
REMOVAL AND INSTALLATION

1. Remove the ignition fuse (Fusible link-F).
2. Disconnect the lead wire.
3. Remove the ignition coil mounting bolt and remove the ignition coil assembly.
4. Installation is the reverse order of removal.


Bolt
Nuts
Ignition

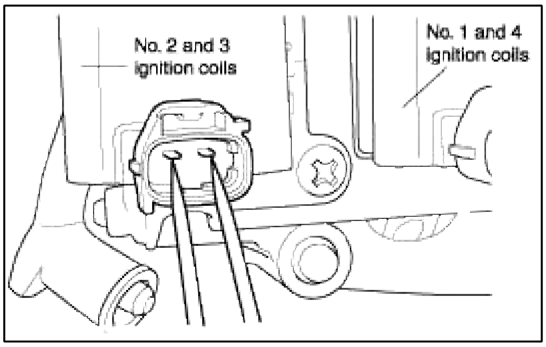
INSPECTION

SPARK TEST


Spark test
Disconnect a high tension ignition cord from the engine, position it about 6 ~ 8mm away from the engine ground part, and then crank the engine.
No spark occurs
Spark occurs
Measure the voltage at the (-)coil while the engine is being cranked.
Voltage does not vary
Voltage varies
Check the coil, wiring, power transistor and ECU.
Chect the coil wire and connector

CHECKING IGNITION COILS

1. Measure the primary coil resistance between terminals 1 and 2.

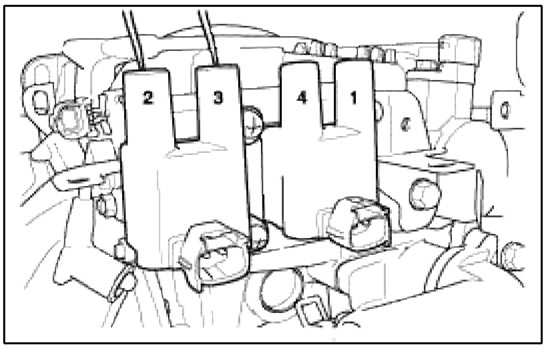

No. 2 and 3 ignition coils
No. 1 and 4 ignition coils

2. Measure the secondary coil resistance between the high-voltage terminal for the No.1 and No.4 cylinders, and between the high-voltage terminals for the No.2 and No.3 cylinders.

: 13.0Ω ± 15%

CAUTION

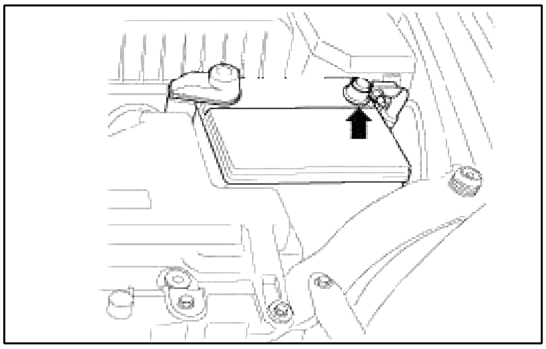
Be sure, when measuring the resistance of the secondary coil, to disconnect the connector of the ignition coil.



Engine Electrical System > Ignition System > Ignition Switch > Repair procedures

REMOVAL AND INSTALLATION

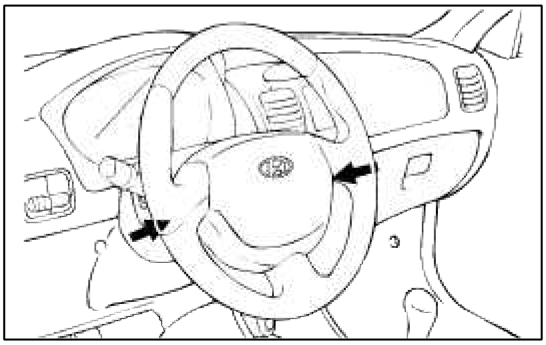
1. Disconnect the negative(-) battery terminal.



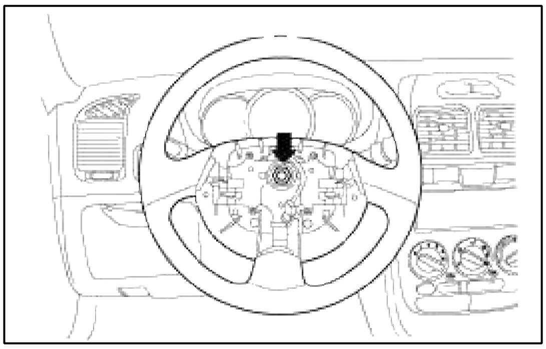
2. Remove the 2 bolts and disconnect the airbag connector and the horn connector, then remove the airbag module.

NOTE

Remove the horn pad only for vehicle without airbag.



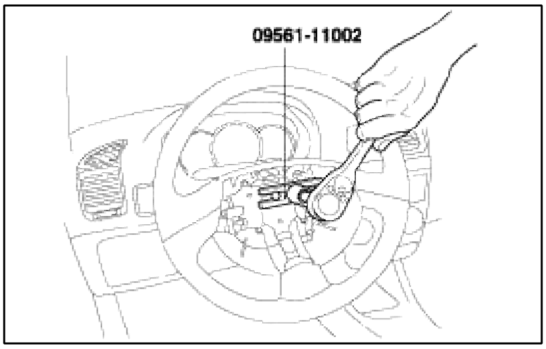
3. Remove the steering wheel lock nut.



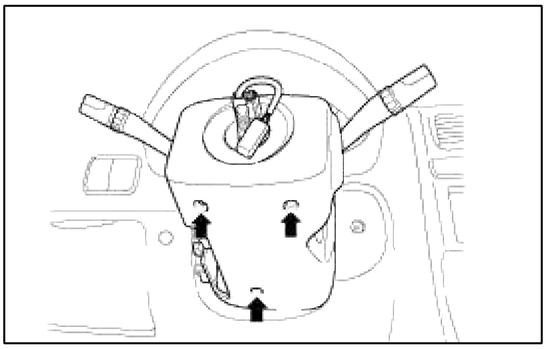
4. Remove the steering wheel with special tool (09561-11002)

NOTE

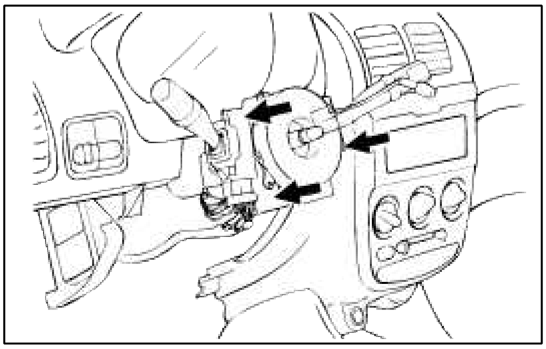
Do not hammer on the steering wheel to remove it. Doing so may damage the collapsible mechanism.



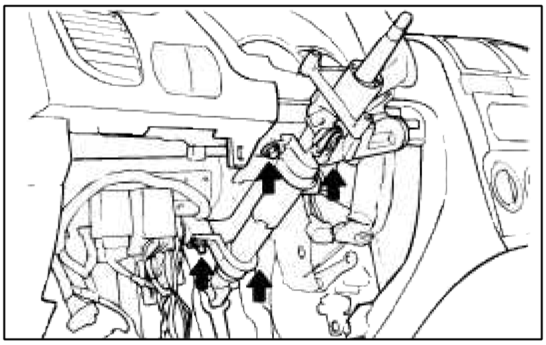
5. Remove the steering column shroud after removing 3 screws.



6. Remove the screws holding the multi-function switch, then disconnect the wire connector. Remove the multi-function switch assembly.



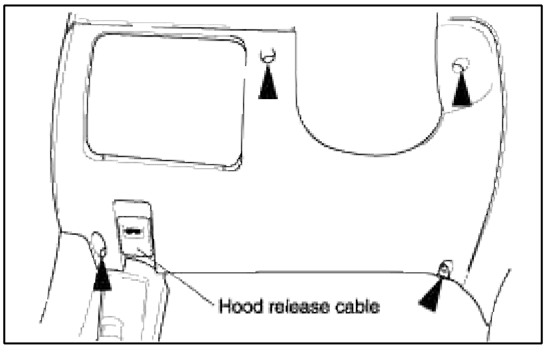
7. Remove the steering column mounting bolts.



8. Remove the key lock assembly from the steering column shaft. (Refer to ST group)
9. Installation is the reverse of removal.

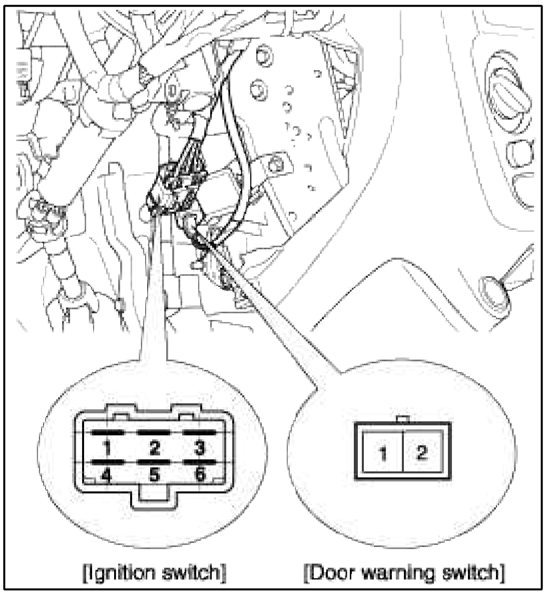
INSPECTION

1. Remove the driver's side crash pad lower panel.



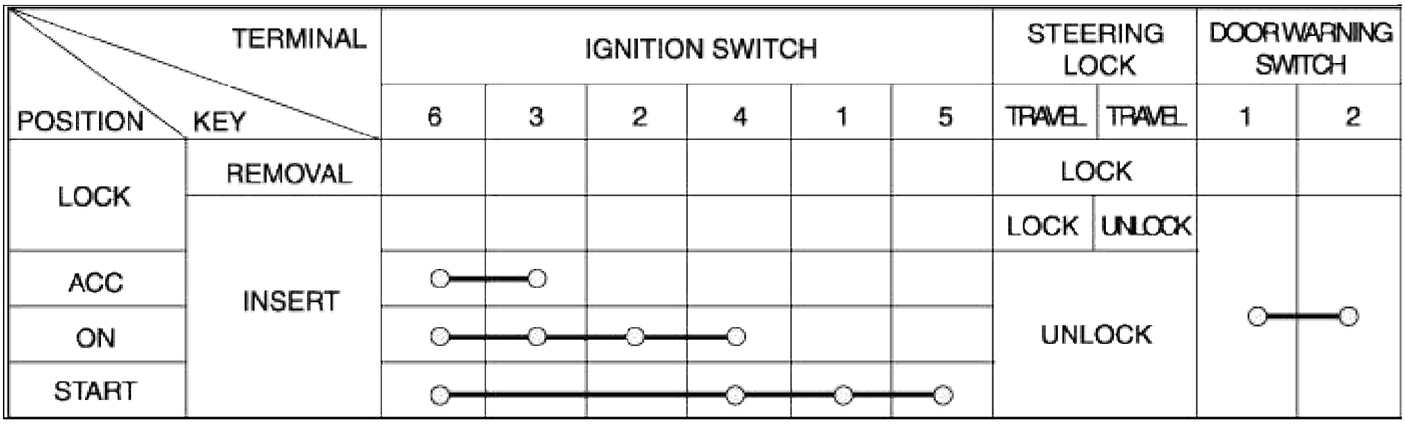
Hood release cable

2. Disconnect the ignition switch connector and the door warning switch connector under the steering column.



1
2
3
4
5
6
1
2
[Ignition switch]
[Door warning switch]

3. Check for continuity between the terminals.
4. If continuity is not as specified, replace the switch.



POSITION	TERMINAL KEY	IGNITION SWITCH						STEERING LOCK		DOOR WARNING SWITCH	
		6	3	2	4	1	5	TRAVEL	TRAVEL	1	2
LOCK	REMOVAL							LOCK			
	INSERT							LOCK	UNLOCK	○	○
ACC		○	○					UNLOCK			
ON		○	○	○	○						
START		○			○	○	○				

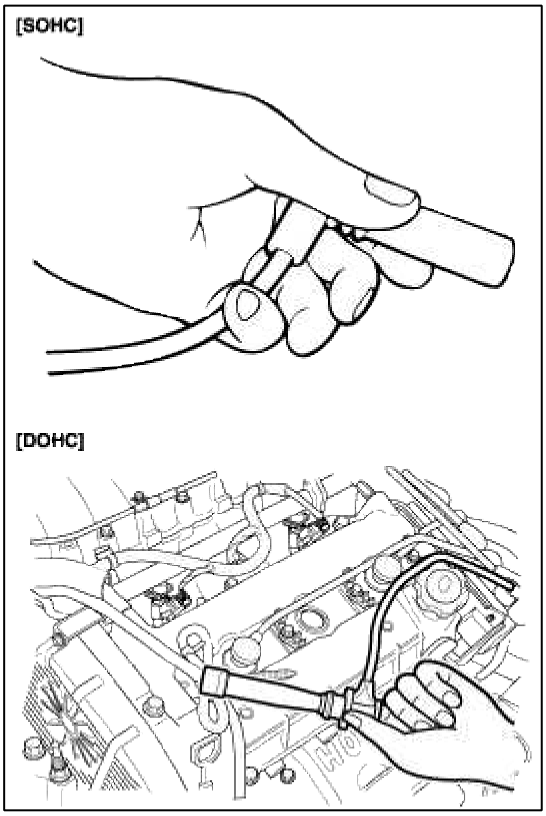
Engine Electrical System > Ignition System > Spark Plug > Repair procedures

INSPECTION

1. Disconnect the spark plug cable from the spark plug.

NOTE

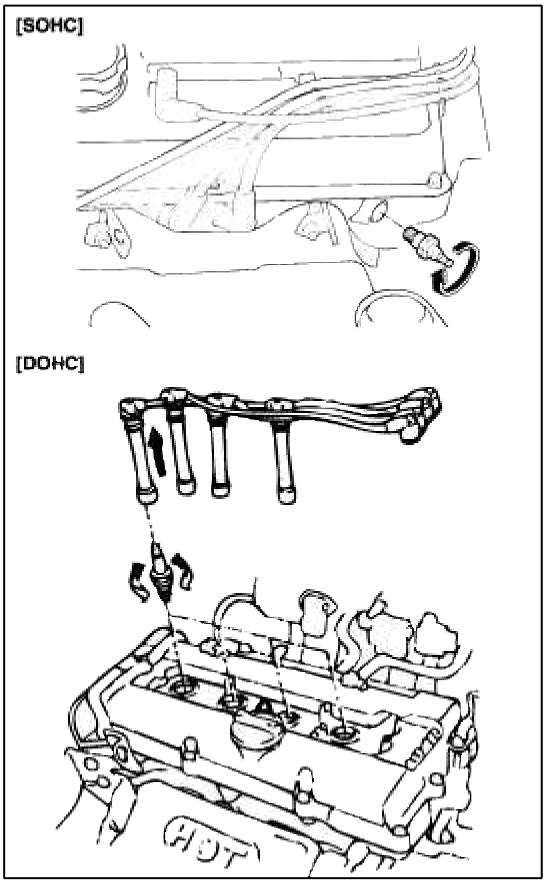
Pull on the spark plug cable boot when removing the spark plug cable, not the cable, as it may be damaged.



2. Using a spark plug socket, remove all spark plugs from the cylinder head.

CAUTION

Take care not to allow contaminants to enter through the spark plug holes.



3. Check the spark plugs for the following :

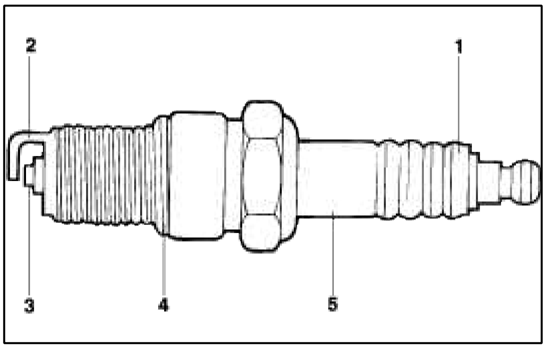
    (1) Broken insulator

    (2) Worn electrode

    (3) Carbon deposits

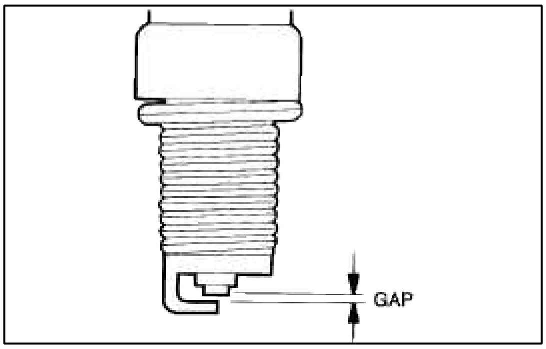
    (4) Damaged broken gasket

    (5) Condition of the porcelain insulator at the tip of the spark plug



4. Check the spark plug gap using a wire gap gauge, and adjust if necessary.

Standard value :
Unleaded : 1.0 ~ 1.1mm (0.039 ~ 0.043 in.)



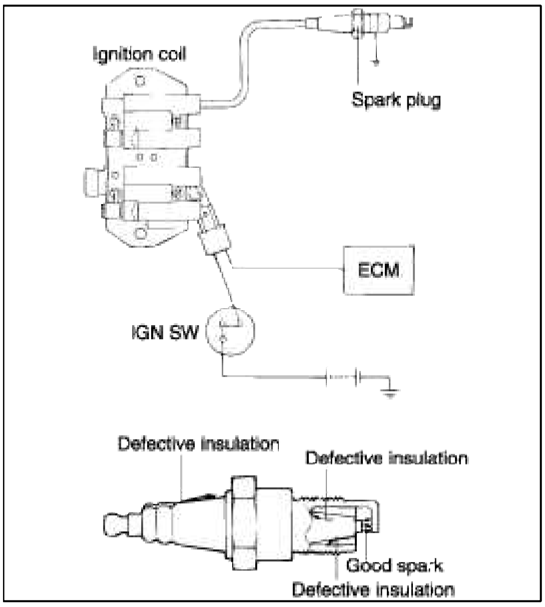
5. Re-insert the spark plug and tighten to the specified torque.
If it is over torqued, damage to the thread portion of cylinder head might result.

Tightening torque :
20 ~ 30 Nm (200 ~ 300 kg·cm, 15 ~ 21 lb·ft)

ANALYZING SPARK PLUGS

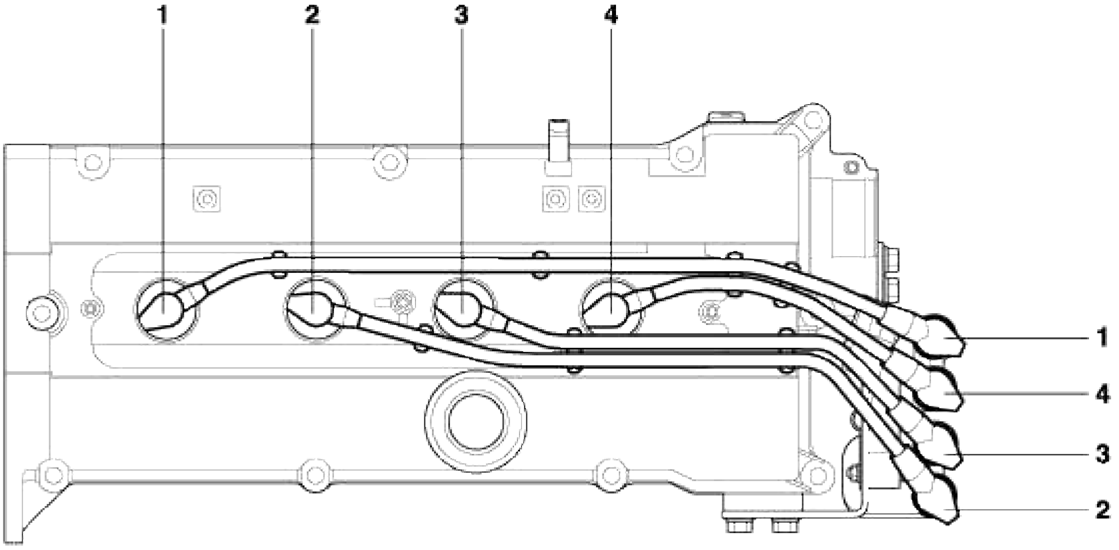
Condition	Dark deposits	White deposits
Description	- Too rich a fuel minture - Low air intake	- Too lean a fuel mixture - Advanced ignition timing - Insufficient plug tightening

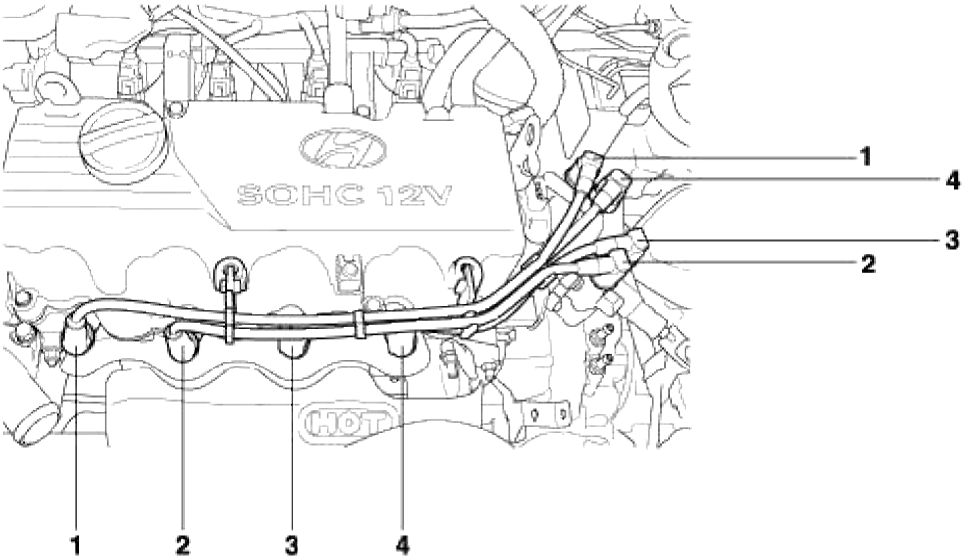
SPARK PLUG TEST (WHEN ENGINE CAN BE CRANKED)


Ignition coil
Spark plug
ECM
IGN SW
Defective insulation
Defective insulation
Good spark
Defective insulation

Engine Electrical System > Ignition System > Spark Plug Cable > Components and Components Location

COMPONENT LOCATION




SOHC 12V
HOT
1
4
3
2
1
2
3
4

Engine Electrical System > Ignition System > Spark Plug Cable > Repair procedures

INSPECTION

CHECKING SPARK PLUG CABLES

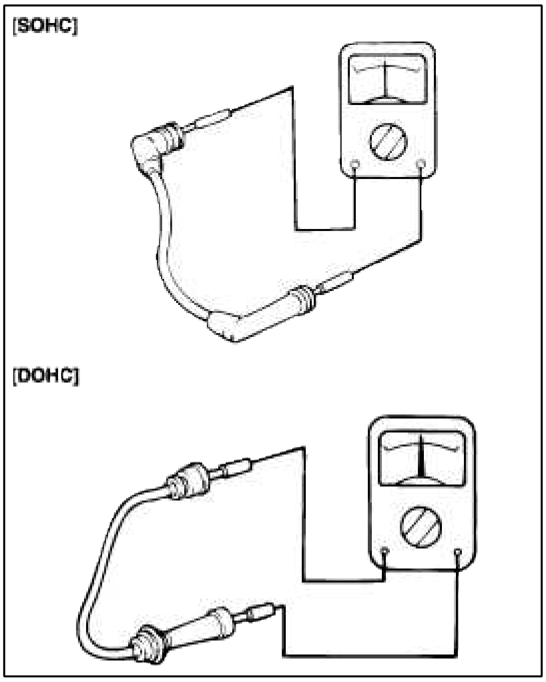
1. Check the cap and outer shell for cracks.

2. Measure the resistance.

Spark plug cable				
CYLINDER	No.1	No.2	No.3	No.4
LENGTH	560	440	360	310
RESISTANCE (BOUGI) Ω	2.51 ~ 3.76	1.97 ~ 2.96	1.61 ~ 2.42	1.39 ~ 2.08
RESISTANCE (R16AIPS) Ω	5.60 ~ 11.76	4.40 ~ 9.24	3.60 ~ 7.56	3.10 ~ 6.51

NOTE

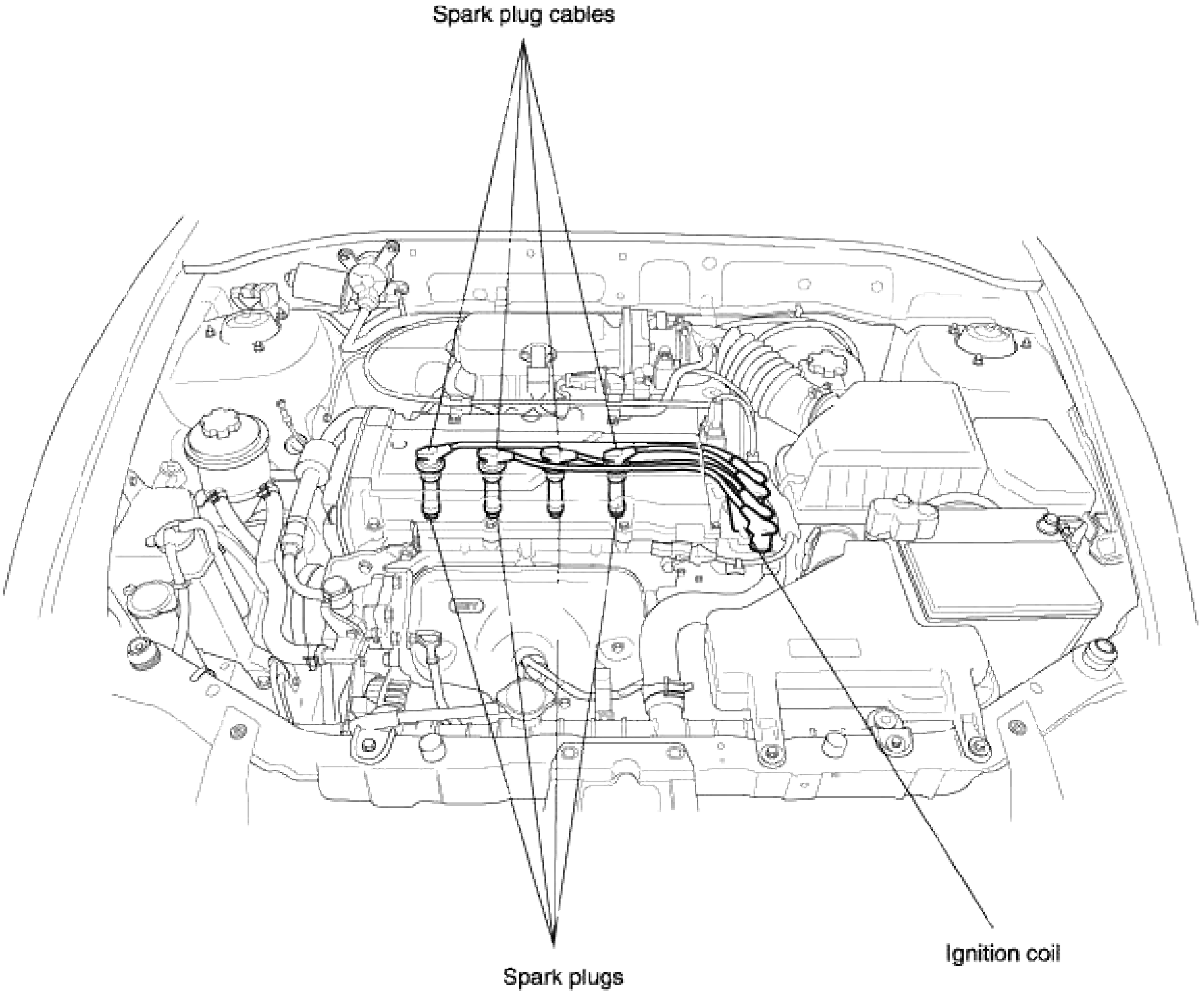
Resistance should not be higher than 10,000 Ω per foot of cable. If resistance is higher, replace the cable.



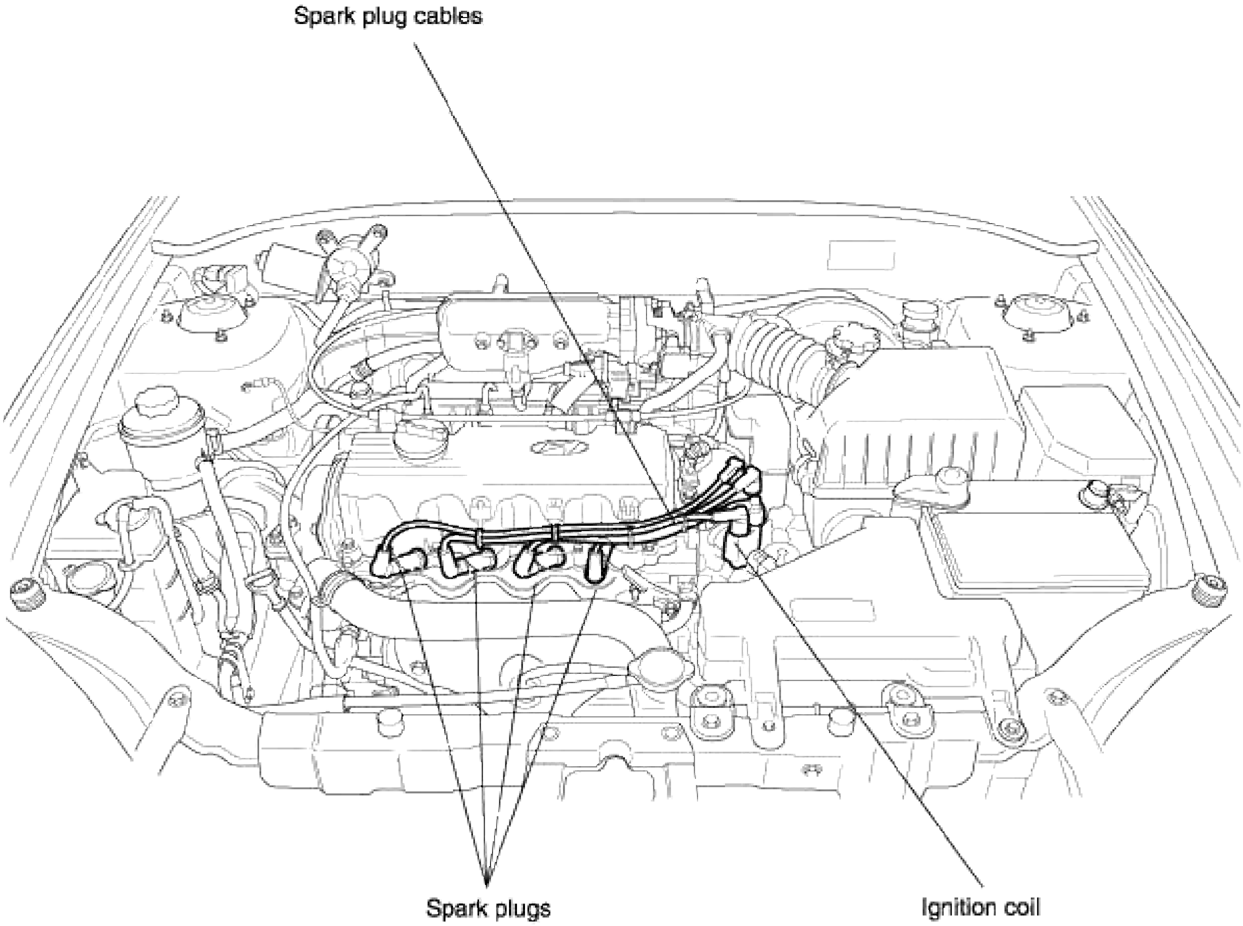
Engine Electrical System > Ignition System > Components and Components Location

COMPONENT LOCATION

[DOHC]

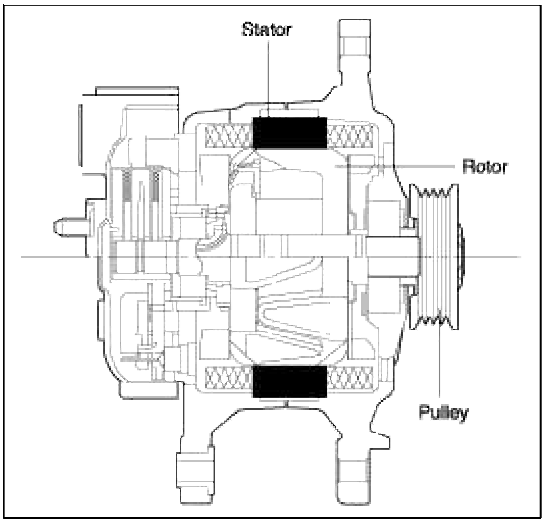

Spark plug cables
Spark plugs
Ignition coil

[SOHC]


Spark plug cables
Spark plugs
Ignition coil

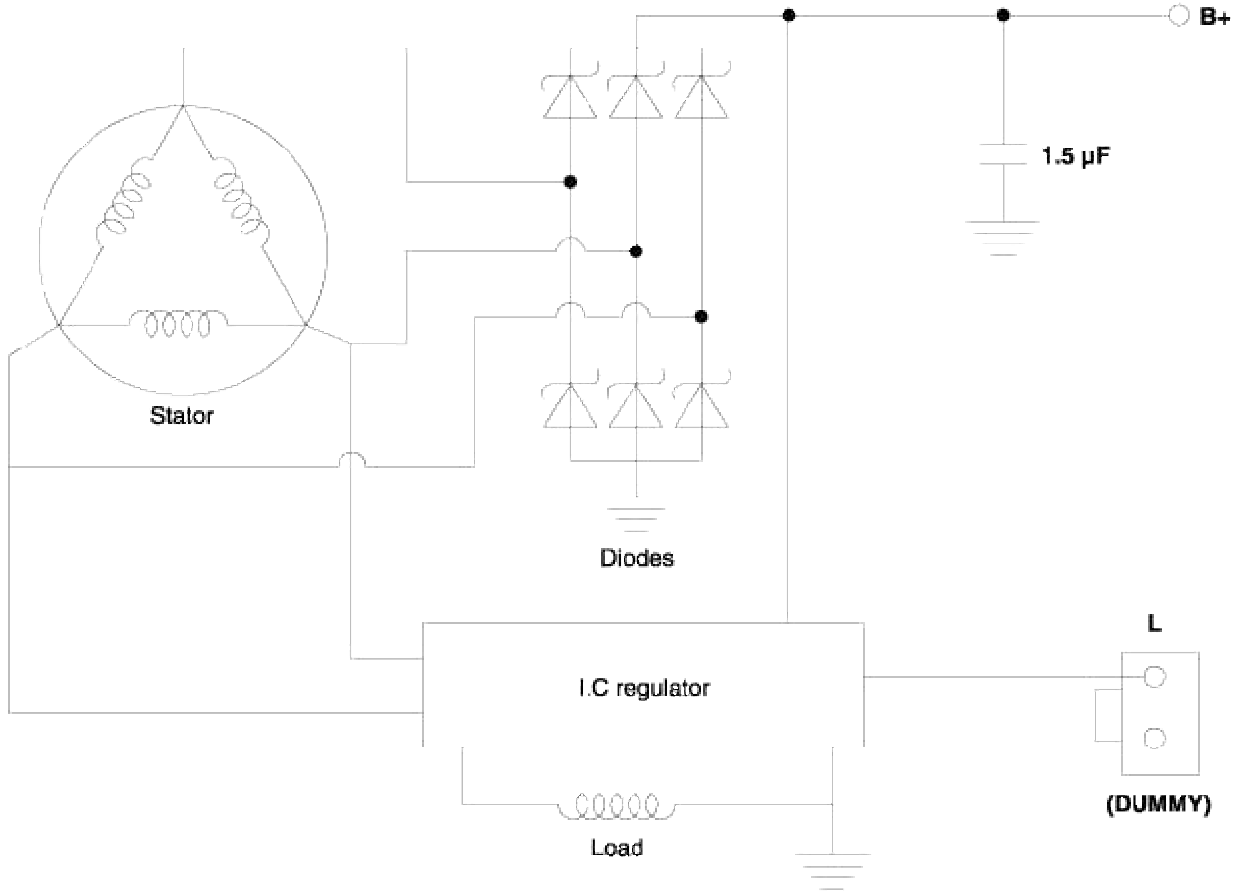
Engine Electrical System > Charging System > General Information

GENERAL INFORMATION


Stator
Rotor
Pulley

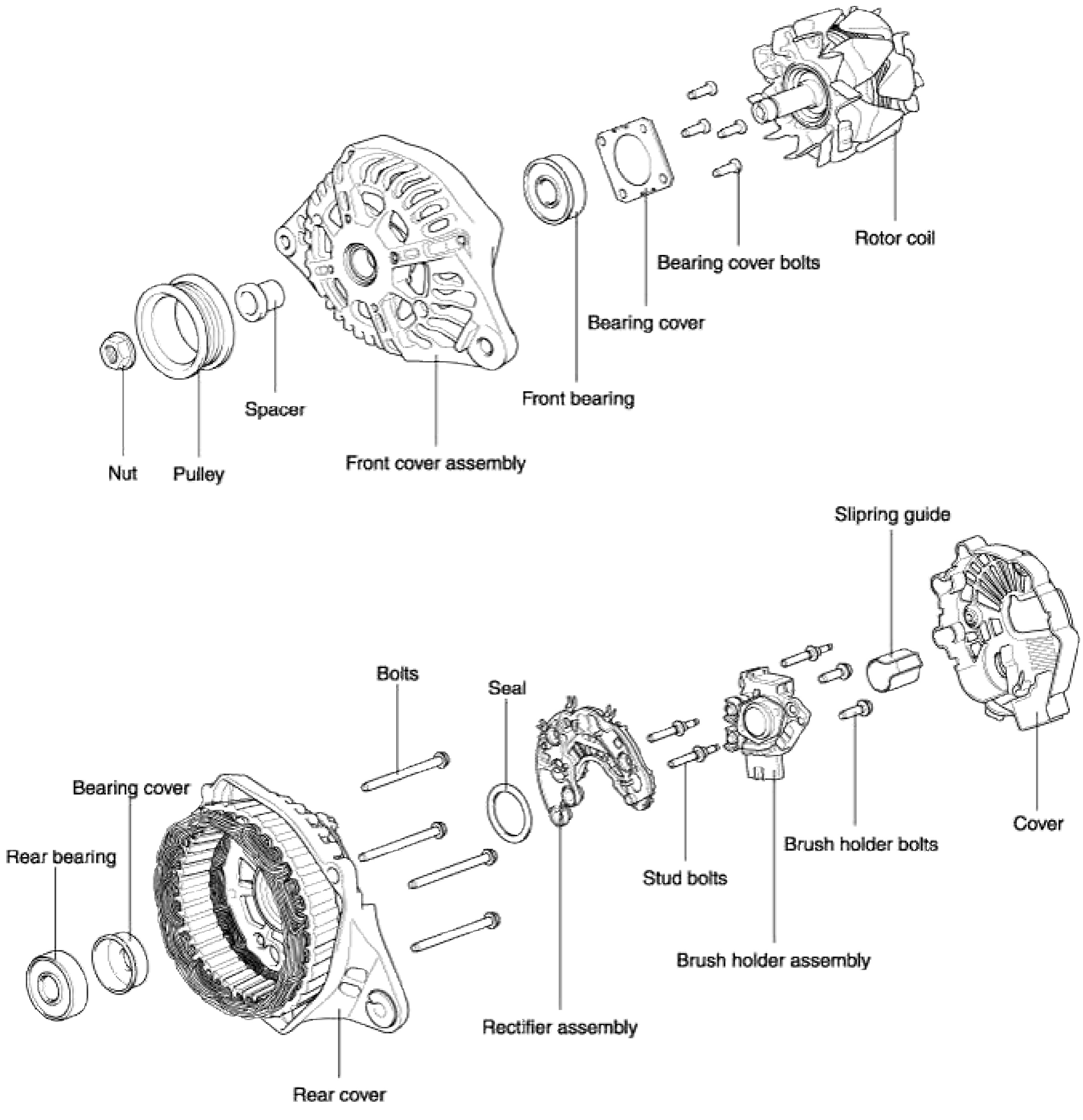
Engine Electrical System > Charging System > Alternator > Schematic Diagrams

CIRCUIT DIAGRAM


B+
1.5 μF
Stator
Diodes
L
I.C regulator
(DUMMY)
Load

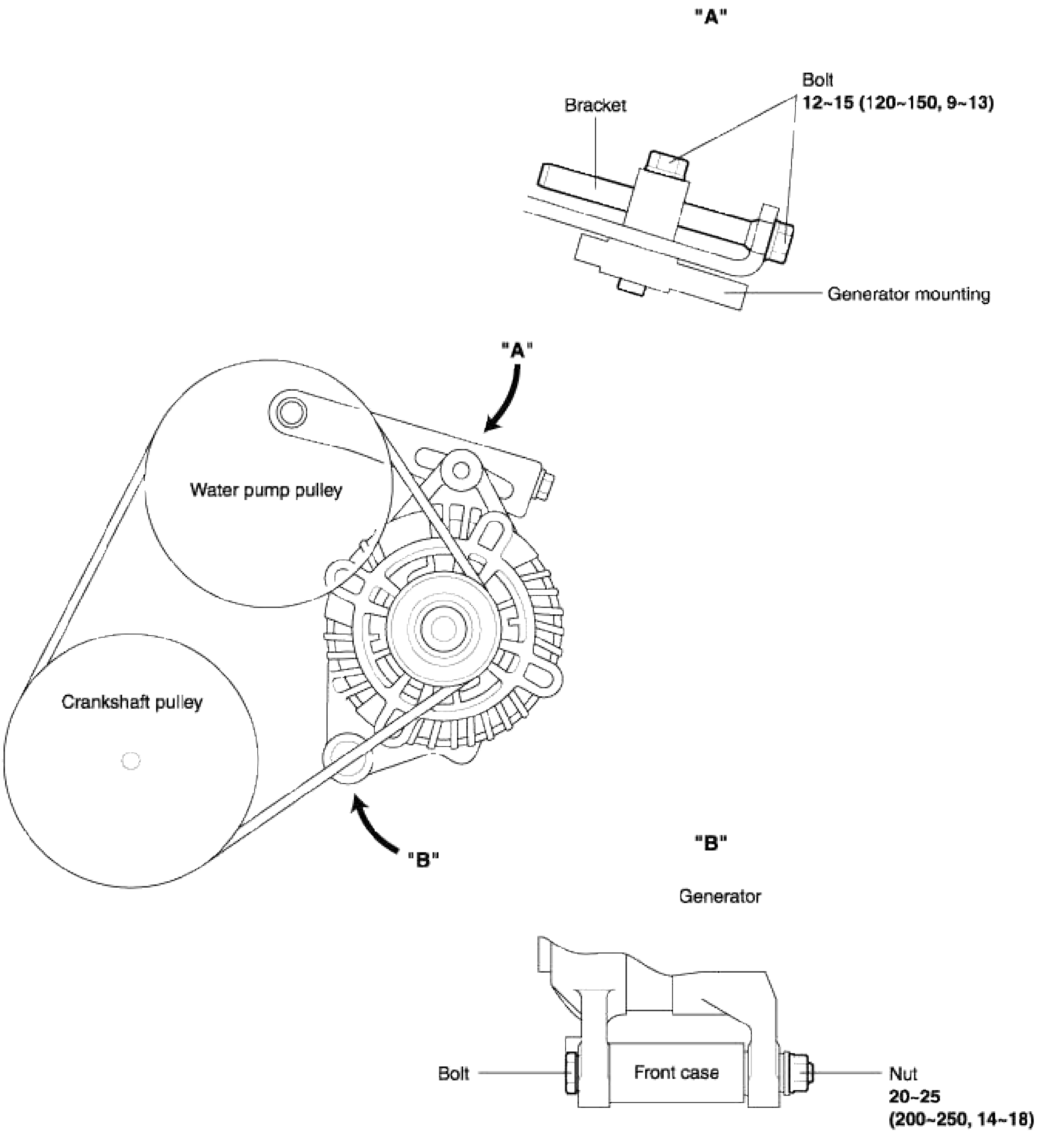
Engine Electrical System > Charging System > Alternator > Components and Components Location

COMPONENTS


Rotor coil
Bearing cover bolts
Bearing cover
Front bearing
Spacer
Front cover assembly
Nut
Pulley
Slipring guide
Bolts
Seal
Bearing cover
Rear bearing
Cover
Brush holder bolts
Stud bolts
Brush holder assembly
Rectifier assembly
Rear cover

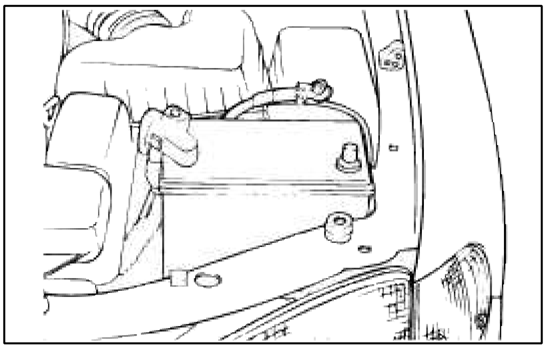
Engine Electrical System > Charging System > Alternator > Repair procedures

INSTALLATION

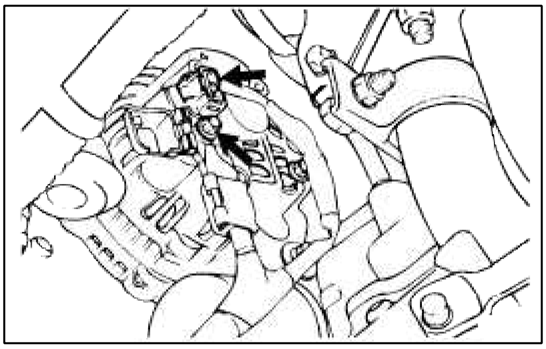

"A"
Bolt
12~15 (120~150, 9~13)
Bracket
Generator mounting
"A"
Water pump pulley
Crankshaft pulley
"B"
"B"
Generator
Bolt
Front case
Nut
20~25
(200~250, 14~18)
TORQUE : Nm (kg-cm, lb-ft)

REMOVAL AND INSTALLATION

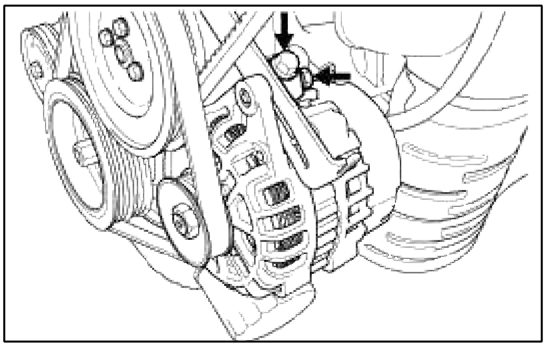
1. Disconnect the negative (-) terminal.



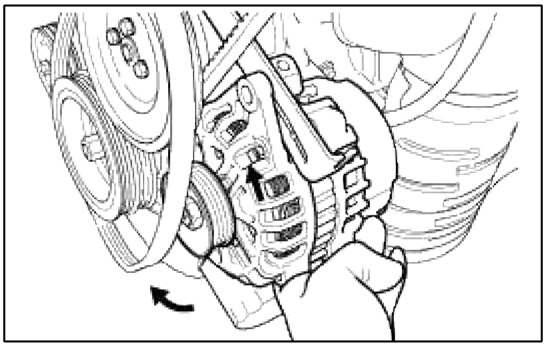
2. Disconnect the generator connector and remove the "B+" terminal cable.



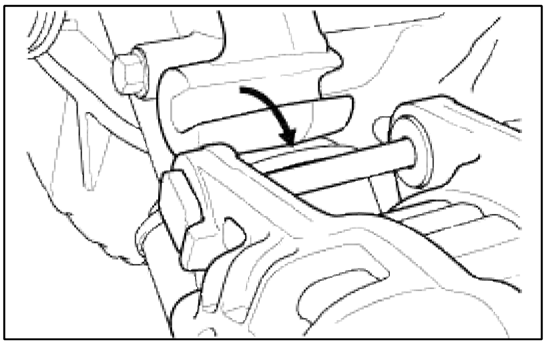
3. Loosen the belt tension adjusting bolt and remove the mounting bolt.



4. Remove the belt by pushing the generator inward.



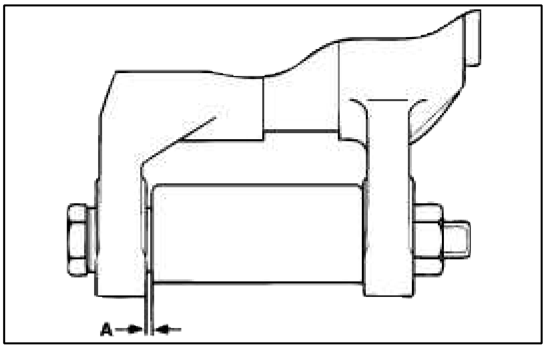
5. Remove the generator assembly.



6. Installation is the reverse of removal.

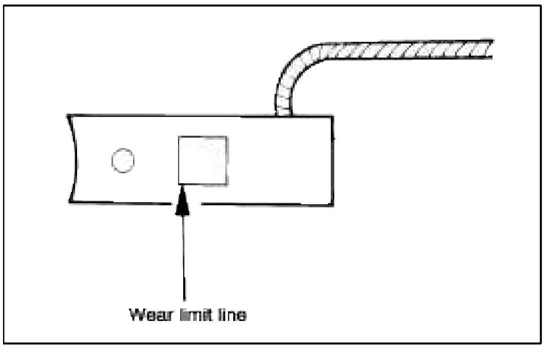
NOTE

1. Position the generator and insert the support bolt. (Do not attach the nut)
2. Push the generator forward and determine how many spacers (thickness : 0.198 mm) should be inserted between the front leg of the generator and the front case. (space "A" in the illustration) (There should be enough spacers so that they do not fall out when you let go of them.)
3. Insert the spacers (space "A" in the illustration), attach the nut, and complete the installation.



REPLACEMENT

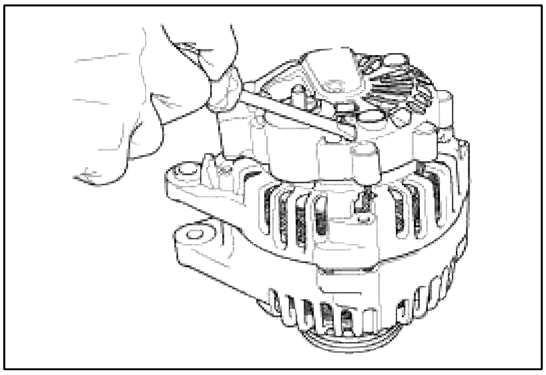
BRUSH



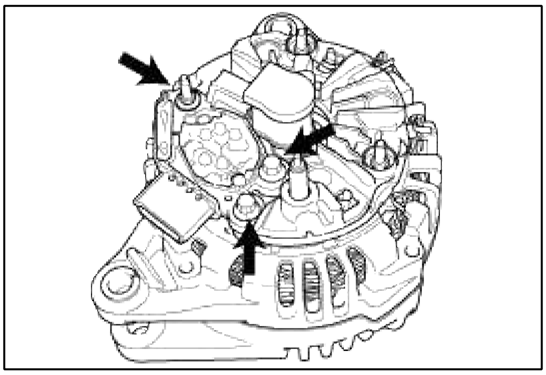
1. Unsolder the pigtail and remove the old brush and spring.
2. Install the brush spring and a new brush in the brush holder.
3. Insert the brush so that there is a space of 2 to 3 mm (0.079 to 0.118 in.) between the limit line and the end of the brush holder.
4. Solder the pigtail to the brush holder.

DISASSEMBLY

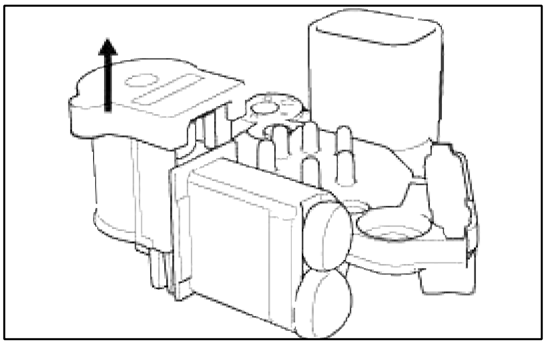
1. Remove the generator cover using a screw driver.



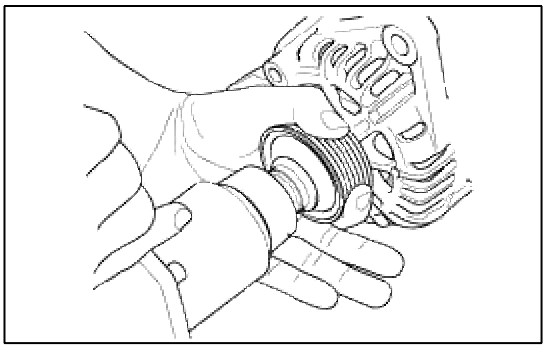
2. Loosen the mounting bolts and disconnect the brush holder assembly.



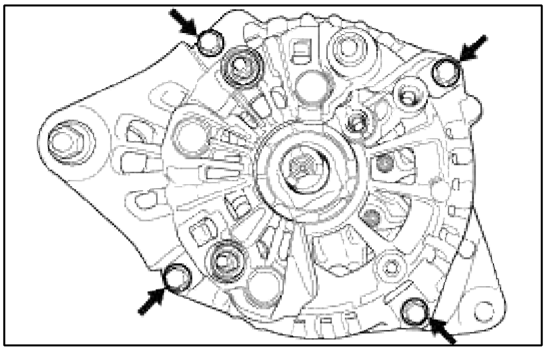
3. Remove the slip ring guide.



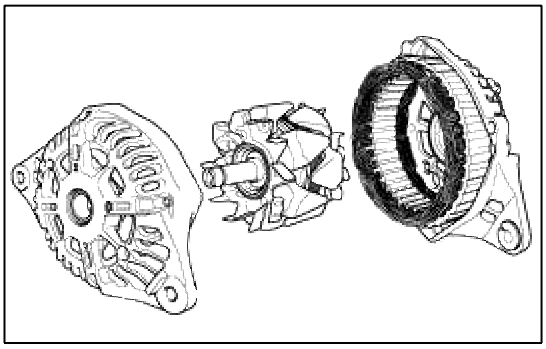
4. Remove the nut, pully and spacer.



5. Loosen the 4 through bolts.



6. Disconnect the rotor and cover.



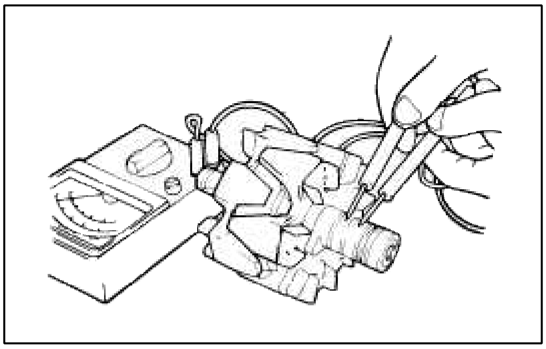
7. Reassembly is the reverse of disassembly.

INSPECTION

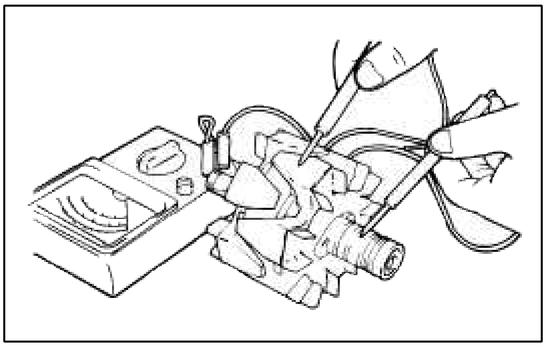
ROTOR

1. Check the rotor coil for continuity. Check to make sure that there is continuity between the slip rings. If resistance is extremely low, it means that there is a short. If there is no continuity or if there is a short circuit, replace the rotor assembly.

Approx. 3.1Ω

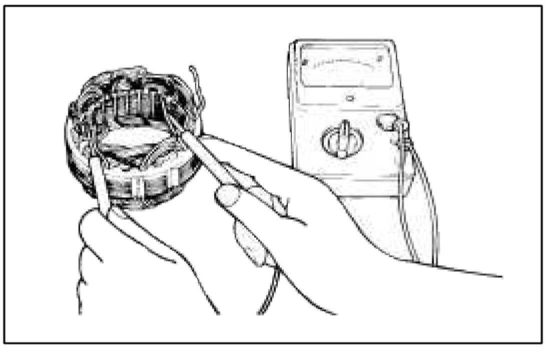


2. Check the rotor coil for ground. Check to make sure that there is no continuity between the slip ring and the core.
   If there is continuity, replace the rotor assembly.

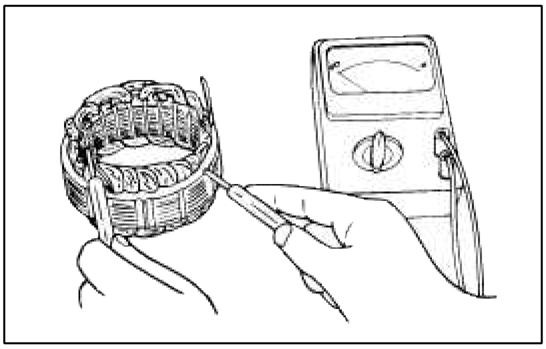


STATOR

1. Make a continuity check on the stator coil. Check to make sure that there is continuity between the coil leads.
   If there is no continuity, replace the stator assembly.



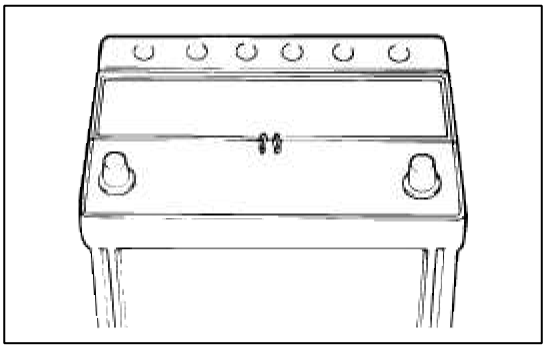
2. Check the coil for grounding. Check to make sure that there is no continuity between the coil and the core.
   If there is continuity, replace the stator assembly.



Engine Electrical System > Charging System > Battery > General Information

GENERAL INFORMATION

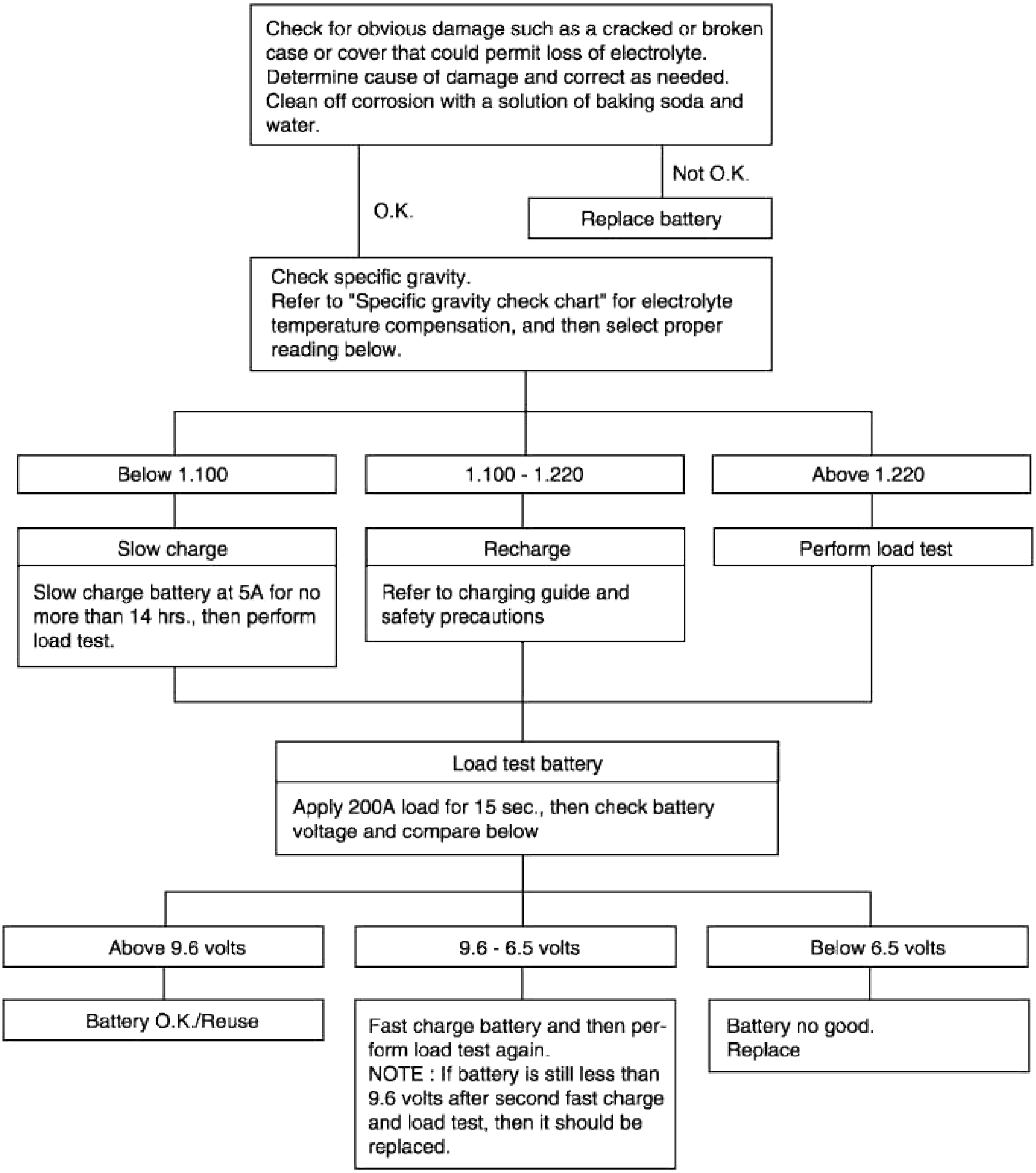
1. The maintenance-free battery is, as the name implies, totally maintenance free and has no removable battery cell caps.
2. Water never needs to be added to the maintenance-free battery.
3. The battery is completely sealed, except for small vent holes in the cover.

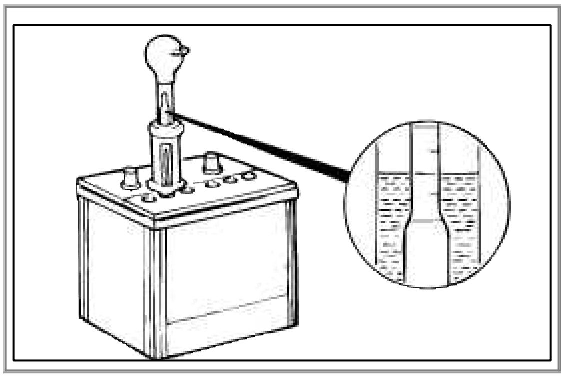


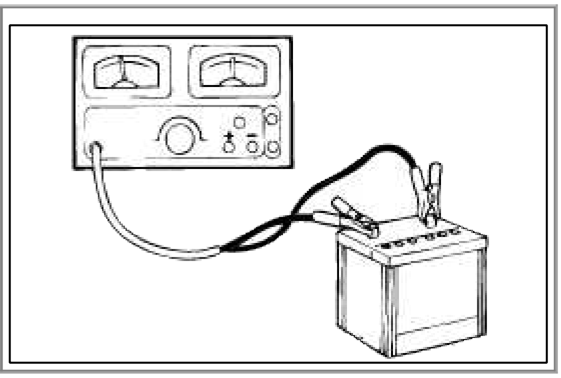
Engine Electrical System > Charging System > Battery > Repair procedures

INSPECTION

BATTERY VISUAL INSPECTION (1)


Check for obvious damage such as a cracked or broken case or cover that could permit loss of electrolyte. Determine cause of damage and correct as needed. Clean off corrosion with a solution of baking soda and water.
Not O.K.
Replace battery
O.K.
Check specific gravity. Refer to "Specific gravity check chart" for electrolyte temperature compensation, and then select proper reading below.
Below 1.100
1.100 - 1.220
Above 1.220
Slow charge
Slow charge battery at 5A for no more than 14 hrs., then perform load test.
Recharge
Refer to charging guide and safety precautions
Perform load test
Load test battery
Apply 200A load for 15 sec., then check battery voltage and compare below
Above 9.6 volts
9.6 - 6.5 volts
Below 6.5 volts
Battery O.K./Reuse
Fast charge battery and then perform load test again. NOTE : If battery is still less than 9.6 volts after second fast charge and load test, then it should be replaced.
Battery no good. Replace

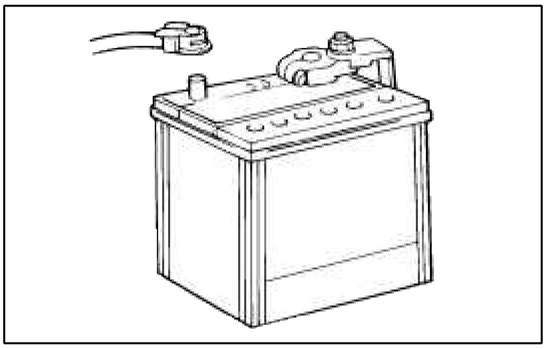




BATTERY VISUAL INSPECTION (2)

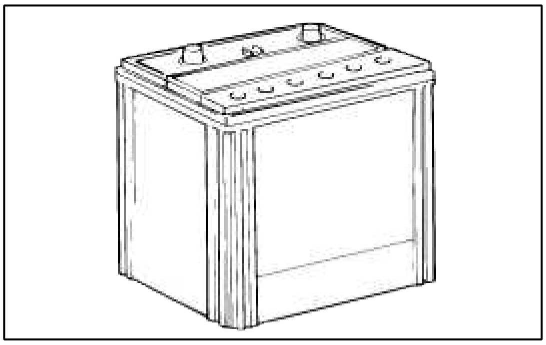
1. Make sure ignition switch is in the Off position and all accessories are Off.
2. Disconnect the battery cables. (negative first)
3. Remove the battery from the vehicle.

> **CAUTION**
>
> Care should be taken in the event that the battery case is cracked or leaking, to protect your skin from the electrolyte. A suitable pair of rubber gloves (not household type) should be worn when removing the battery.



4. Inspect the battery carrier for damage caused by the loss of acid from the battery. If acid damage is present, it will be necessary to clean the area with a solution of clean, warm water and baking soda. Scrub the area with a stiff brush and wipe off with a cloth moistened with baking soda and water.
5. Clean the top of the battery with the same solution as described in step 4.
6. Inspect the battery case, and cover, for cracks. If cracks are present, the battery must be replaced.
7. Clean the battery posts with a suitable battery post cleaner.
8. Clean the inside surface of the terminal clamps with a suitable battery terminal cleaning tool. Replace damaged or frayed cables and broken terminal clamps.
9. Install the battery in the vehicle.
10. Connect the cable terminals to the battery post, making sure the top of the terminals are flush with the top of the post.
11. Tighten the terminal nut securely.
12. Coat all connections with light mineral grease after tightening.

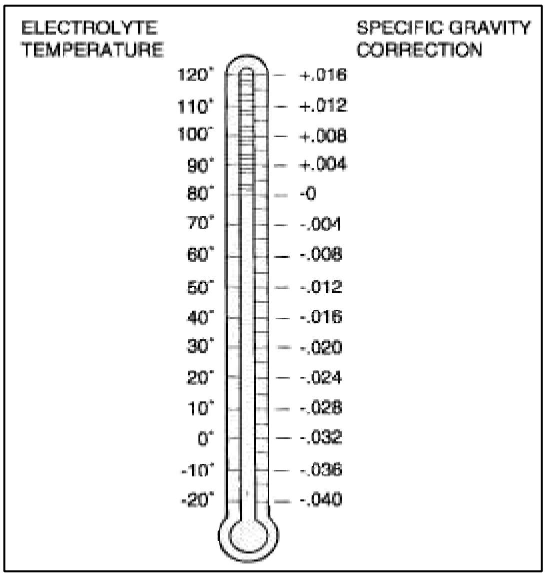
> **CAUTION**
>
> When batteries are being charged, an explosive gas forms beneath the cover of each cell. Do not smoke near batteries being charged or which have recently been charged. Do not break live circuits at the terminals of the batteries being charged. A spark will occur where the circuit is broken. Keep all flames away from an open battery.



SPECIFIC GRAVITY CHECK CHART

CAUTION

A difference of 50 points (0.050) or more between one or more cells indicates a defective battery. It should be replaced.

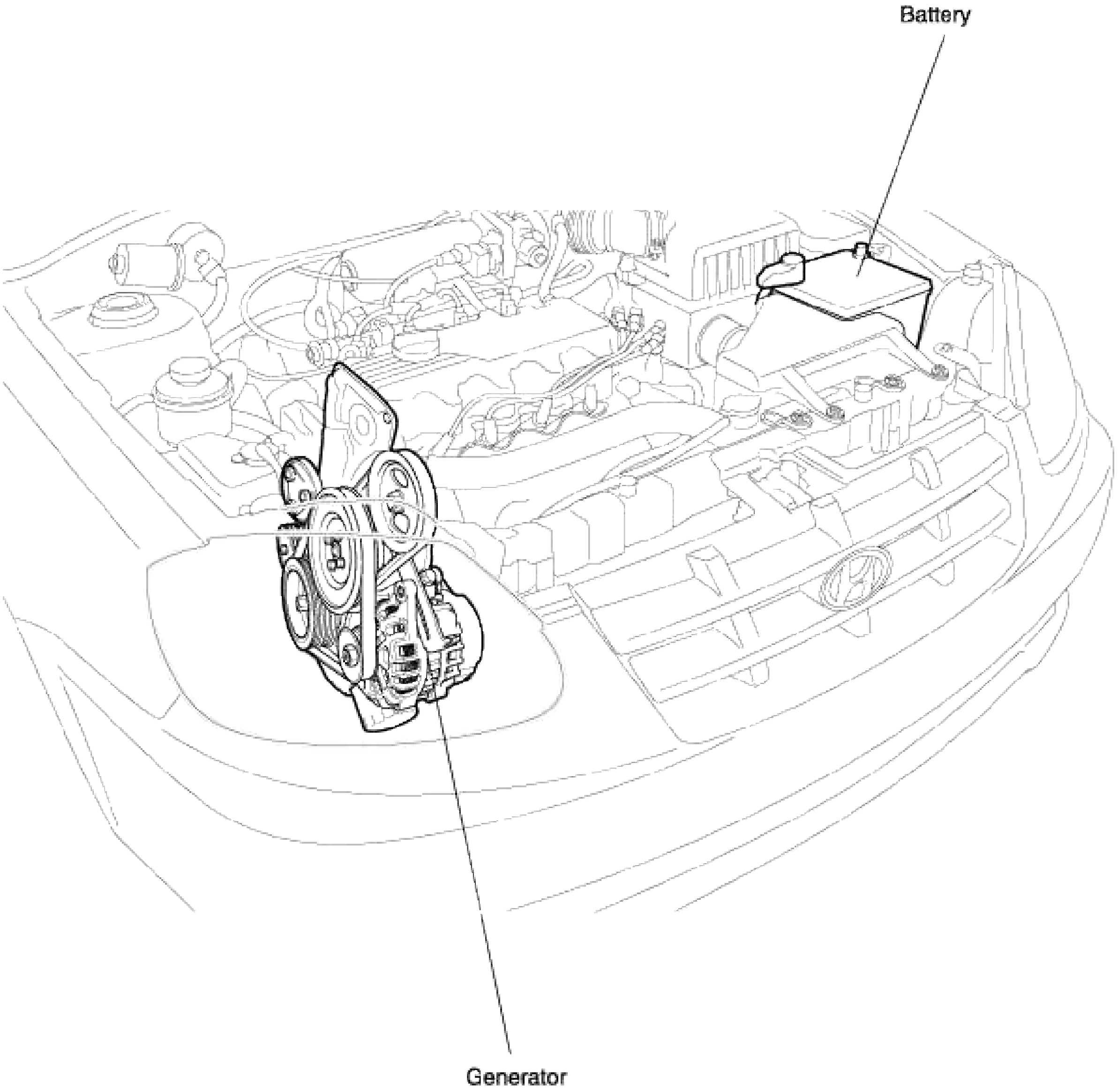

ELECTROLYTE TEMPERATURE
SPECIFIC GRAVITY CORRECTION
120° +.016
110° +.012
100° +.008
90° +.004
80° -0
70° -.004
60° -.008
50° -.012
40° -.016
30° -.020
20° -.024
10° -.028
0° -.032
-10° -.036
-20° -.040

BATTERY CHARGE RATE

Specific gravity	Charge method	
	Slow charge (5A)	**Fast charge (20A)**
Below 1.100	14 hours	4 hours
100 ~ 1.130	12 hours	3 hours
130 ~ 1.160	10 hours	2.5 hours
160 ~ 1.190	8 hours	2.0 hours
190 ~ 1.220	6 hours	1.5 hours
Above 1.220	4 hours	1.0 hours

Engine Electrical System > Charging System > Components and Components Location

COMPONENT LOCATION


Battery
Generator

Engine Electrical System > Charging System > Repair procedures

INSPECTION

VOLTAGE DROP TEST OF GENERATOR OUTPUT WIRE

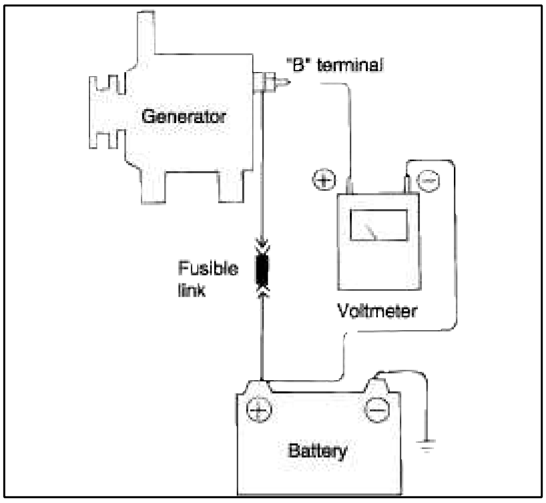
1. Turn the ignition switch to "OFF".

> **NOTE**
>
> To identify connection problems, be sure not to disturb either of the two terminals or their connections during this test.

2. Connect a digital voltmeter between the generator "B" terminal and battery (+) terminal. Connect the (+) lead wire of the voltmeter to the "B" terminal and the (-) lead wire to the battery (+) terminal.

CONDITIONS FOR TESTING

1. The voltmeter should read a standard 0.3V.
2. If the reading is above 0.3V, poor wiring should be suspected.
   Check wiring from generator 'B' terminal through the fusible link to the battery (+) terminal.
   Check for loose wiring or color change from an overheated harness. Correct and check again.
3. On completion of the test, set the engine at idle.
   Then turn off the headlamps, blower motor etc., and ignition.



OUTPUT CURRENT TEST

1. Prior to the test, check the following items and correct as necessary.
   A. Check if that the battery installed in the vehicle is in good condition. For details, see "BATTERY".

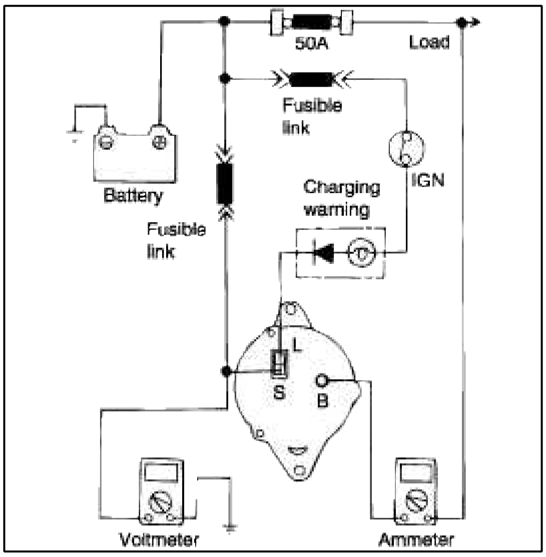
> **NOTE**
>
> The battery that is used to test the output current should be one that has been partially discharged. With a fully charged battery, the test may not be conducted correctly due to an insufficient load.

   B. Check the tension of the generator drive belt. See "COOLING".
2. Turn the ignition switch to "OFF".
3. Disconnect the battery ground cable.
4. Disconnect the generator output wire from the generator "B" terminal.
5. Connect a DC ammeter (0 to 100A) in series between the "B" terminal and the disconnected output wire. Be sure to connect the (-) lead wire of the ammeter to the disconnected output wire.

> **NOTE**
>
> Tighten each connection securely, as a heavy current will flow. Do not rely on clips.

6. Connect a voltmeter (0 to 20V) between the "B" terminal and ground. Connect the (+) lead wire to the generator "B" terminal and (-) lead wire to a good ground.
7. Attach an engine tachometer and connect the battery ground cable.

8. Leave the engine hood open.



TEST

1. Check to see that the voltmeter reads the same value as the battery voltage. If the voltmeter reads 0V, an open circuit in the wire between the generator "B" terminal and battery (-) terminal, a blown fusible link or poor ground is suspected.
2. Start the engine and turn the headlights on.
3. Set the headlights to high beam and the heater blower switch to HIGH, quickly increase the engine speed to 2,500 rpm and read the maximum output current value indicated by the ammeter.

> NOTE
>
> After the engine starts, the charging current quickly drops. Therefore, the above operation must be done quickly to read the maximum current value correctly.

RESULT

1. The ammeter reading must be higher than the limit value. If it is lower but the generator output wire is in good condition, remove the generator from the vehicle and test it.

Limit value
63A min : 90A generator

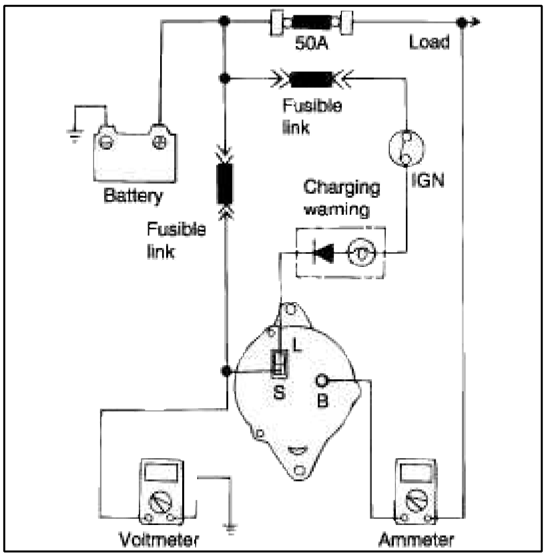
> NOTE
>
> 1. The nominal output current value is shown on the nameplate affixed to the generator body.
> 2. The output current value changes with the electrical load and the temperature of the generator itself. Therefore, the nominal output current may not be obtained. In such case, keep the headlights on to discharge the battery, or use the lights of another vehicle to increase the electrical load.

2. Upon completion of the output current test, lower the engine speed to idle and turn off the ignition switch.
3. Disconnect the battery ground cable.
4. Remove the ammeter and voltmeter and the engine tachometer.
5. Connect the generator output wire to the generator "B" terminal.
6. Connect the battery ground cable.

REGULATED VOLTAGE TEST

1. Prior to the test, check the following items and correct if necessary.
   A. Check that the battery installed in the vehicle is fully charged. For battery checking method, see the "BATTERY" section.
   B. Check the generator drive belt tension. For belt tension check, see section, "COOLING".

2. Turn ignition switch to "OFF".
3. Disconnect the battery ground cable.
4. Connect a digital voltmeter between the "S(L)" terminal of the generator and ground.
   Connect the (+) lead of the voltmeter to the "S(L)" terminal of the generator. Connect the (-) lead to a good ground or the battery (-)terminal.
5. Disconnect the generator output wire from the generator "B" terminal.
6. Connect a DC ammeter (0 to 100A) in series between the "B" terminal and the disconnected output wire.
   Connect the (-) lead wire of the ammeter to the disconnected output wire.
7. Attach the engine tachometer and connect the battery ground cable.



TEST

1. Turn on the ignition switch and check to see that the voltmeter indicates the following value.
   Voltage : Battery voltage
   If it reads 0V, there is an open circuit in the wire between the generator "S(L)" terminal and the battery and the battery (+), or the fusible link is blown.
2. Start the engine. Keep all lights and accessories off.
3. Run the engine at a speed of about 2,500 rpm and read the voltmeter when the generator output current drops to 10A or less.

RESULT

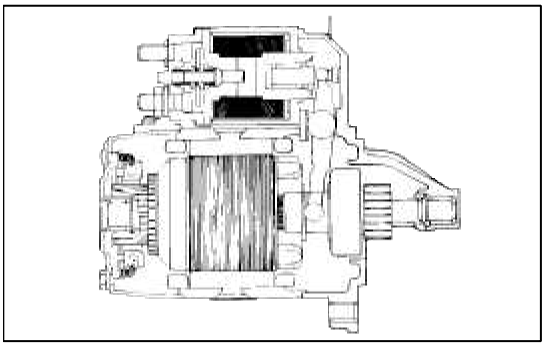
1. If the voltmeter reading agrees with the value listed in the Regulating Voltage Table below, the voltage regulator is functioning correctly.
   If the reading is other than the standard value, the voltage regulator or the generator is faulty.
   REGULATING VOLTAGE TABLE

Voltage regulator ambient temperature °C (°F)	Regulating voltage V
	90A generator
-20 (-4) 20 (68) 60 (140) 80 (176)	14.3 ~ 15.2 14.1 ~ 14.7 13.5 ~ 14.4 13.3 ~ 14.3

2. Upon completion of the test, reduce the engine speed to idle, and turn off the ignition switch.
3. Disconnect the battery ground cable.
4. Remove the voltmeter, ammeter, and the engine tachometer.
5. Connect the generator output wire to the generator "B" terminal.
6. Connect the battery ground cable.

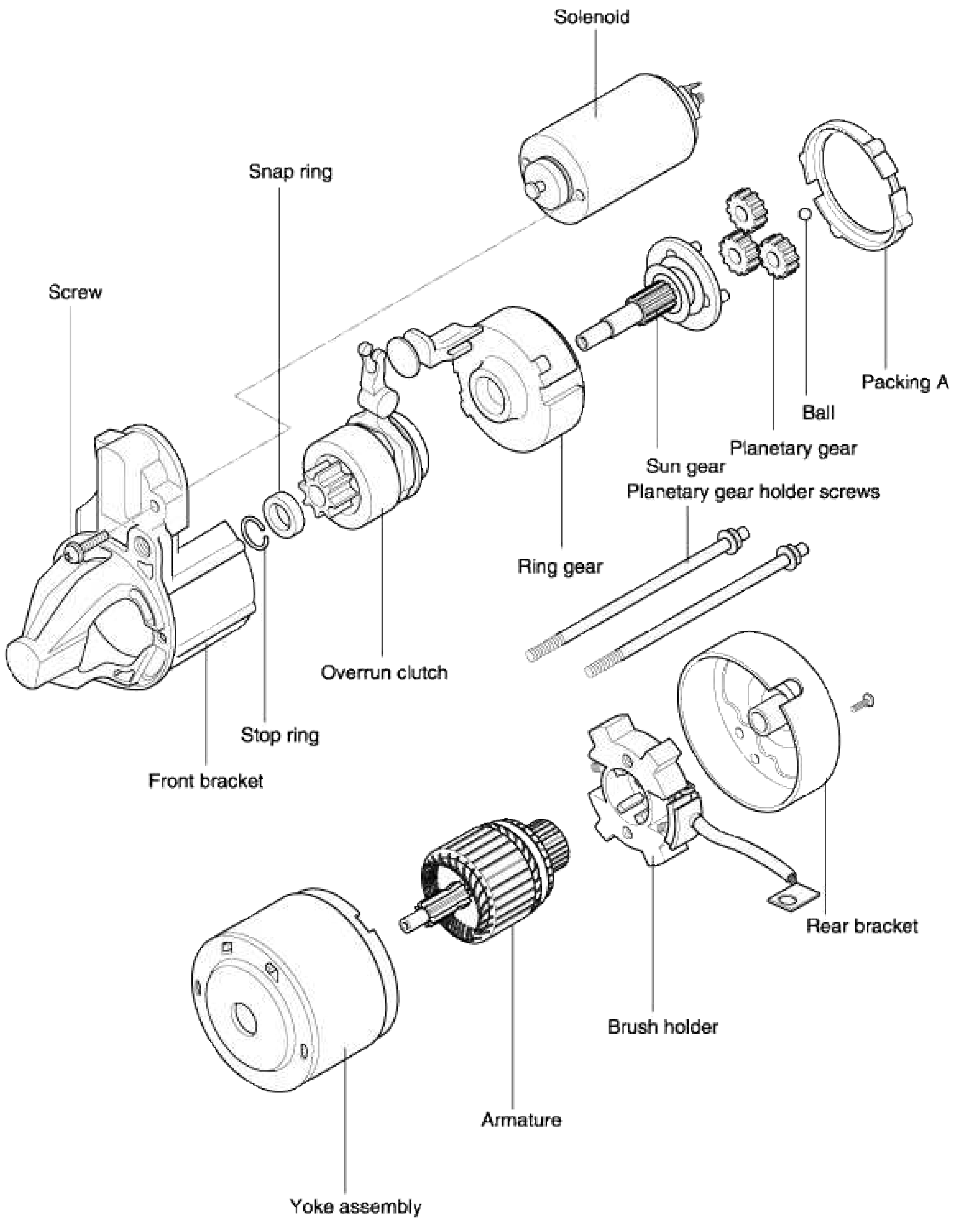
Engine Electrical System > Starting System > General Information

GENERAL INFORMATION



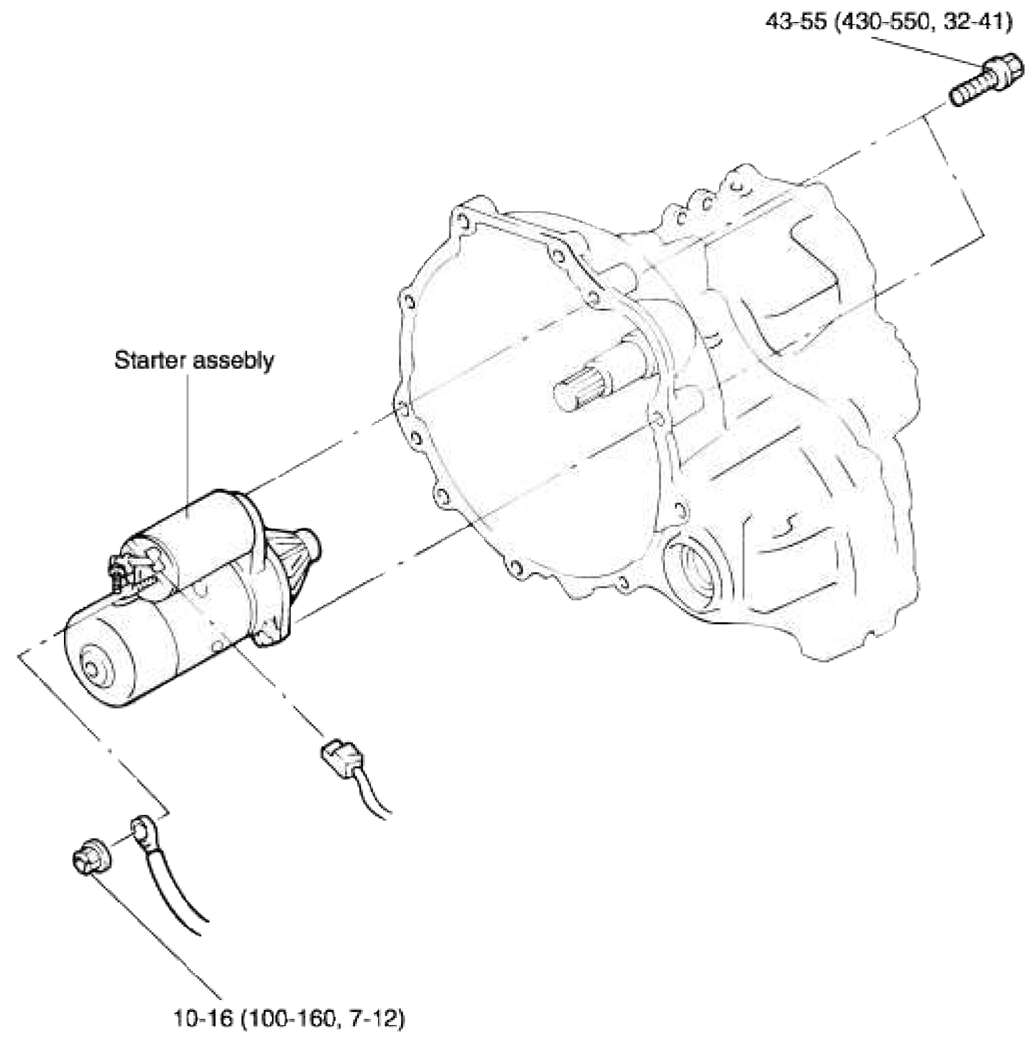
Engine Electrical System > Starting System > Starter > Components and Components Location

COMPONENTS


Solenoid
Snap ring
Screw
Packing A
Ball
Planetary gear
Sun gear
Planetary gear holder screws
Ring gear
Overrun clutch
Stop ring
Front bracket
Rear bracket
Brush holder
Armature
Yoke assembly

Engine Electrical System > Starting System > Starter > Repair procedures

REMOVAL AND INSTALLATION


43-55 (430-550, 32-41)
Starter assebly
10-16 (100-160, 7-12)

TORQUE : Nm (kg·cm, lb·ft)

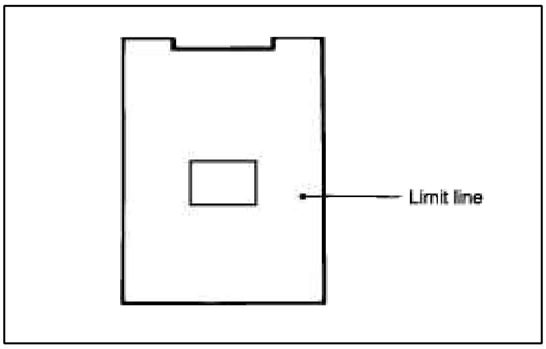
1. Disconnect the battery ground cable.
2. Remove the speedometer cable and the shift cable.
3. Disconnect the starter motor connector and terminal.
4. Remove the starter motor assembly.
5. Installation is the reverse order of removal.

REPLACEMENT

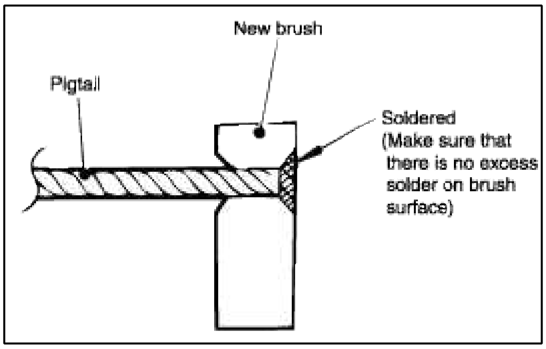
BRUSHES AND SPRINGS

1. Brushes that are worn out, or oil-soaked, should be replaced.

2. When replacing field coil brushes, crush worn out brush with pliers, taking care not to damage pigtail.



3. Sand the pigtail end with sandpaper to ensure good soldering.
4. Insert the pigtail into hole provided in the new brush and solder it. Make sure that the pigtail and excess solder do not come out onto the brush surface.
5. When replacing the ground brush, slide the brush from brush holder by prying retaining the spring back.


New brush
Pigtail
Soldered
(Make sure that
there is no excess
solder on brush
surface)

INSPECTION

CHECKING THE COMMUTATOR

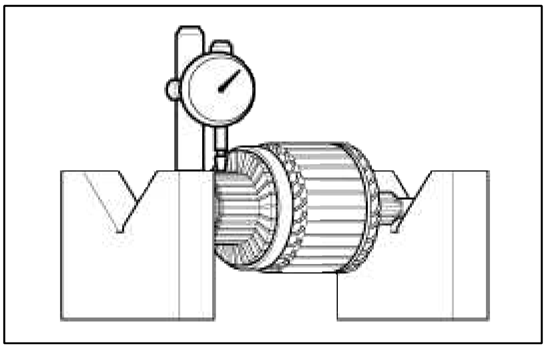
1. Place the armature on a pair of V-blocks, and check the deflection by using a dial gauge.

Standard value

Armature run-out : 0.05 mm (0.002 in.)

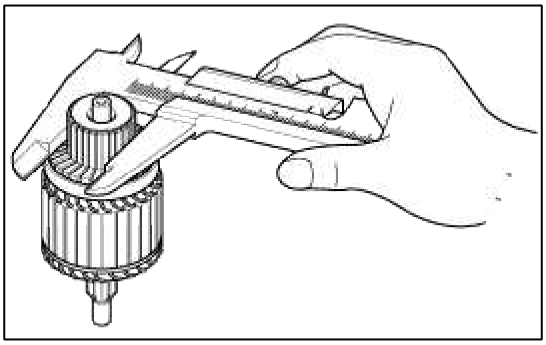
Limit

Armature run-out : 0.1 mm (0.0039 in.)



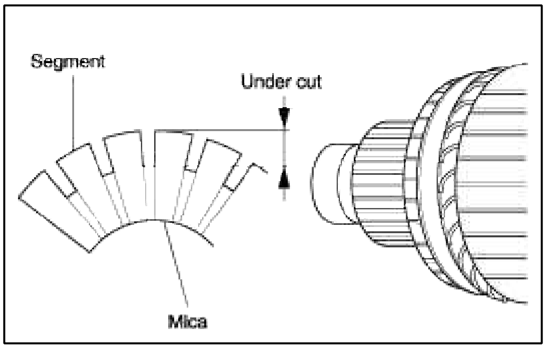
2. Check the outer diameter of the commutator.

Standard value
Outer diameter of the commutator : 29.4 mm (1.157 in.)
Limit
Outer diameter of the commutator : 28.4 mm (1.118 in.)

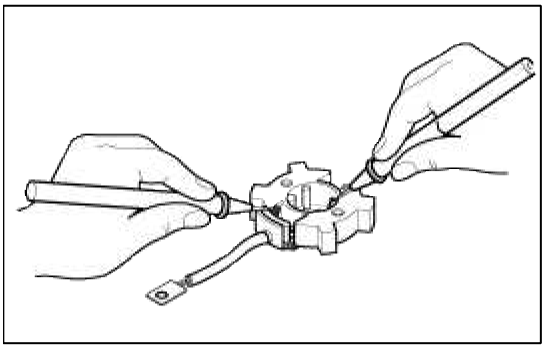


3. Check the depth of the undercut between segments.

Standard value
Depth of the undercut between segments :
0.5 mm (0.020 in.)
Limit
Depth of the undercut between segments :
0.2 mm (0.079 in.)



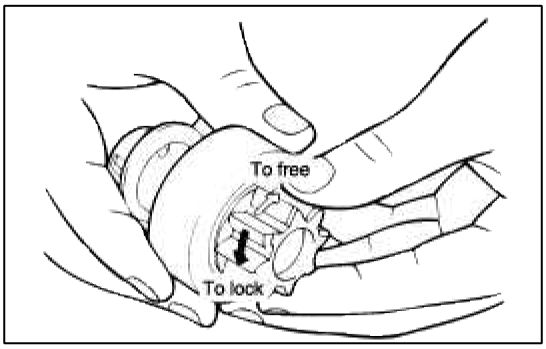
BRUSH HOLDER



OVERRUNNING CLUTCH

1. While holding clutch housing, rotate the pinion. Drive pinion should rotate smoothly in one direction, but should not rotate in opposite direction. If clutch does not function properly, replace the overrunning clutch assembly.

2. Inspect pinion for wear or burrs. If pinion is worn or burred, replace overrunning clutch assembly. If pinion is damaged, also inspect ring gear for wear or burrs.



FRONT AND REAR BRACKET BUSHING

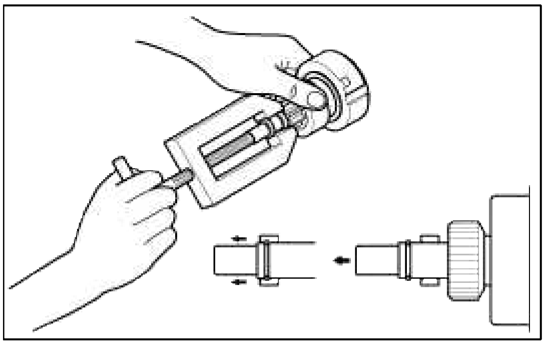
CLEANING

STARTER MOTOR PARTS

1. Do not immerse parts in cleaning solvent, lmmersing the yoke and field coil assembly and/or armature will damage insulation. Wipe these parts with a cloth only.
2. Do not immerse drive unit in cleaning solvent. Over-running clutch is pre-lubricated a t the factory and solvent will wash lubrication from clutch.
3. The drive unit may be cleaned with a brush moistened with cleaning solvent and wiped dry with a cloth.

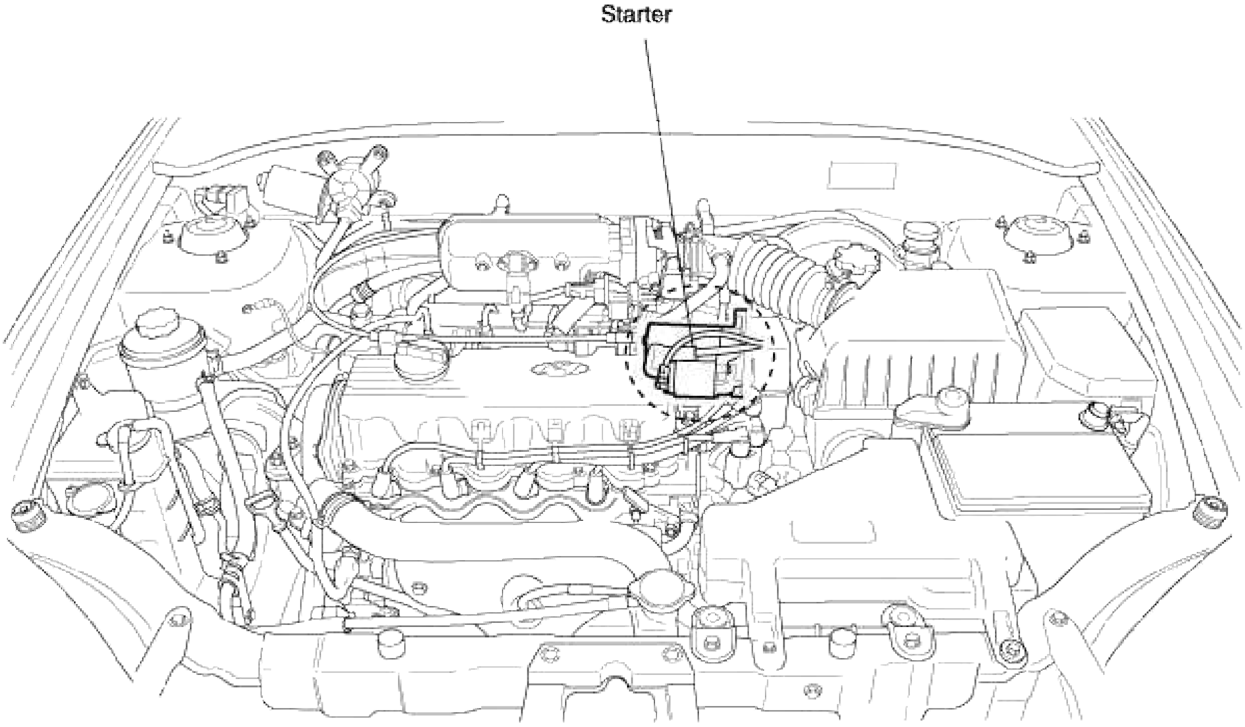
REASSEMBLY

STOP RING AND SNAP RING



Engine Electrical System > Starting System > Components and Components Location

COMPONENT LOCATION



Engine Electrical System > Starting System > Repair procedures

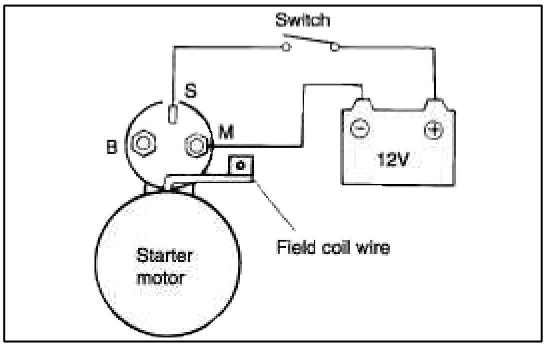
INSPECTION

SERVICE ADJUSTMENT PROCEDURES FOR PINION GAP ADJUSTMENT

1. Disconnect the field coil wire from the M-terminal of the solenoid.
2. Connect a 12V battery the S-terminal and the M-terminal.

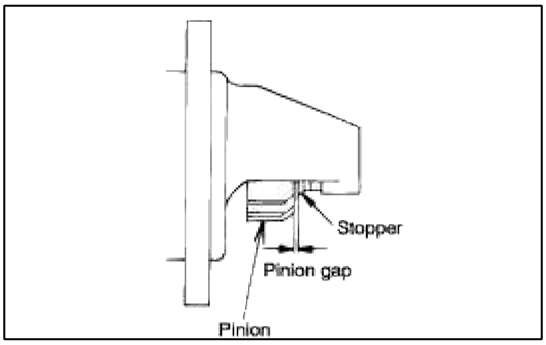
3. The pinion will move out.

> **CAUTION**
>
> This test must be performed quickly (in less than 10 seconds) to prevent the coil from burning.

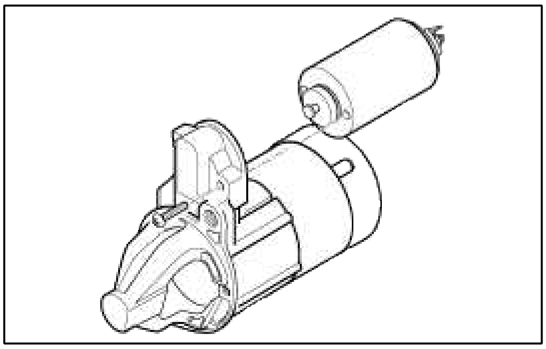

Switch
S
M
B
12V
Field coil wire
Starter motor

4. Check the pinion for stopper clearance (pinion gap) with a feeler gauge.

: 0.5 ~ 2.0 mm (0.02 ~ 0.079 in.)


Stopper
Pinion gap
Pinion

5. If the pinion gap is out of specification, adjust by adding or removing gaskets between the solenoid and the front bracket.

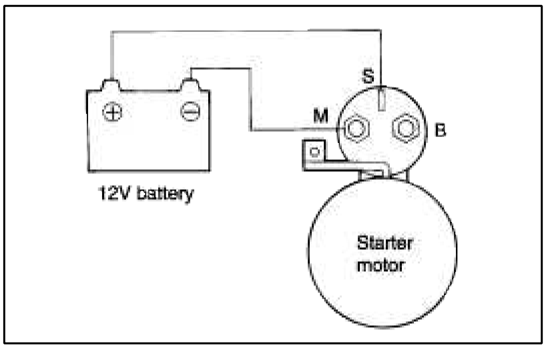


MAGNETIC SWITCH PULL-IN TEST

1. Disconnect the field coil wire from the M-terminal of the magnetic switch.
2. Connect a 12V battery between the S-terminal and the M- terminal.

> **CAUTION**
>
> This test must be performed quickly (in less than 10 seconds) to prevent the coil from burning.

3. If the pinion moves out, then the pull-in coil is good. If it doesn't move out, replace the magnetic switch.

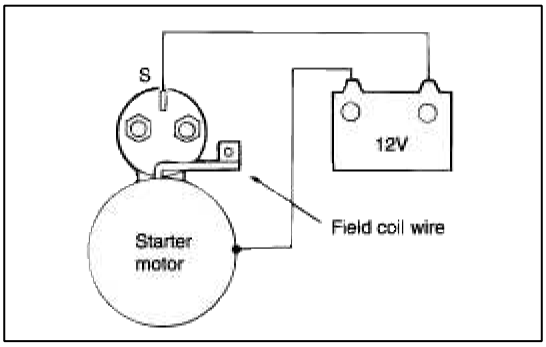

S
M
B
12V battery
Starter motor

MAGNETIC SWITCH HOLD-IN TEST

1. Disconnect the field coil wire from the M-terminal of the magnetic switch.
2. Connect a 12V battery between the S-terminal and the body.

> **CAUTION**
>
> This test must be performed quickly (in less than 10 seconds) to prevent the coil from burning.

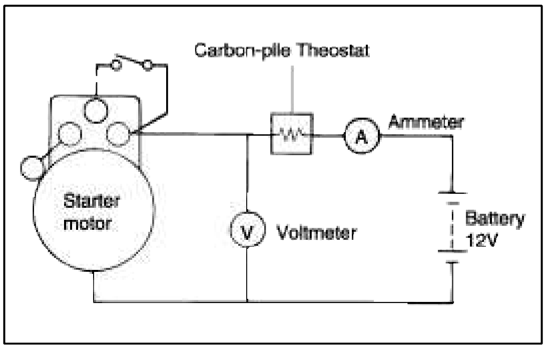
3. If the pinion moves out, everything is in order. If the pinion moves back and forth repeatedly, the hold-in circuit is open. Then replace the magnetic switch.


S
12V
Field coil wire
Starter motor

FREE RUNNING TEST

1. Place the starter motor in a vise equipped with soft jaws and connect a fully-charged 12-volt battery to starter motor as follows:
2. Connect a test ammeter (100-ampere scale) and carbon pile rheostat as shown is the illustration.
3. Connect a voltmeter (15-volt scale) across starter motor.
4. Rotate carbon pile to the off position.
5. Connect the battery cable from battery's negative post to the starter motor body.
6. Adjust until battery voltage shown on the voltmeter reads 11 volts.
7. Confirm that the maximum amperage is within the specifications and that thestarter motor turns smoothly and freely:

Max. 90 Amps
Min. 2,800 Amps

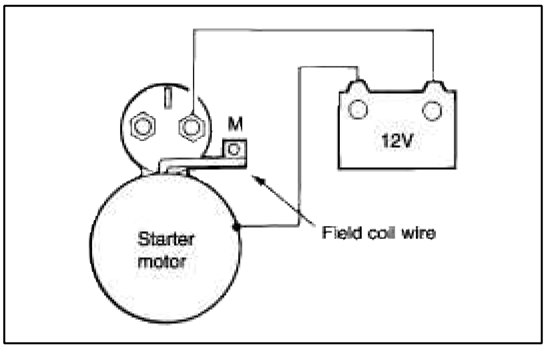

Carbon-plle Theostat
Ammeter
A
V
Voltmeter
Battery 12V
Starter motor

MAGNETIC SWITCH RETURN TEST

1. Disconnect field coil wire from the M-terminal of the magnetic switch.
2. Connect a 12V battery between M-terminal and the body.

> **NOTE**
>
> This test must be performed quickly (in less than 10 seconds) to prevent the coil from burning.

3. Pull pinion out and release. If pinion returns quickly to its original position, everything is in order. If it doesn't, replace the magnetic switch.



Engine Electrical System > Troubleshooting > P0300

[P0300]

DTC	Diagnostic item
P0300	Multiple Cylinder Misfire Detected

DESCRIPTION

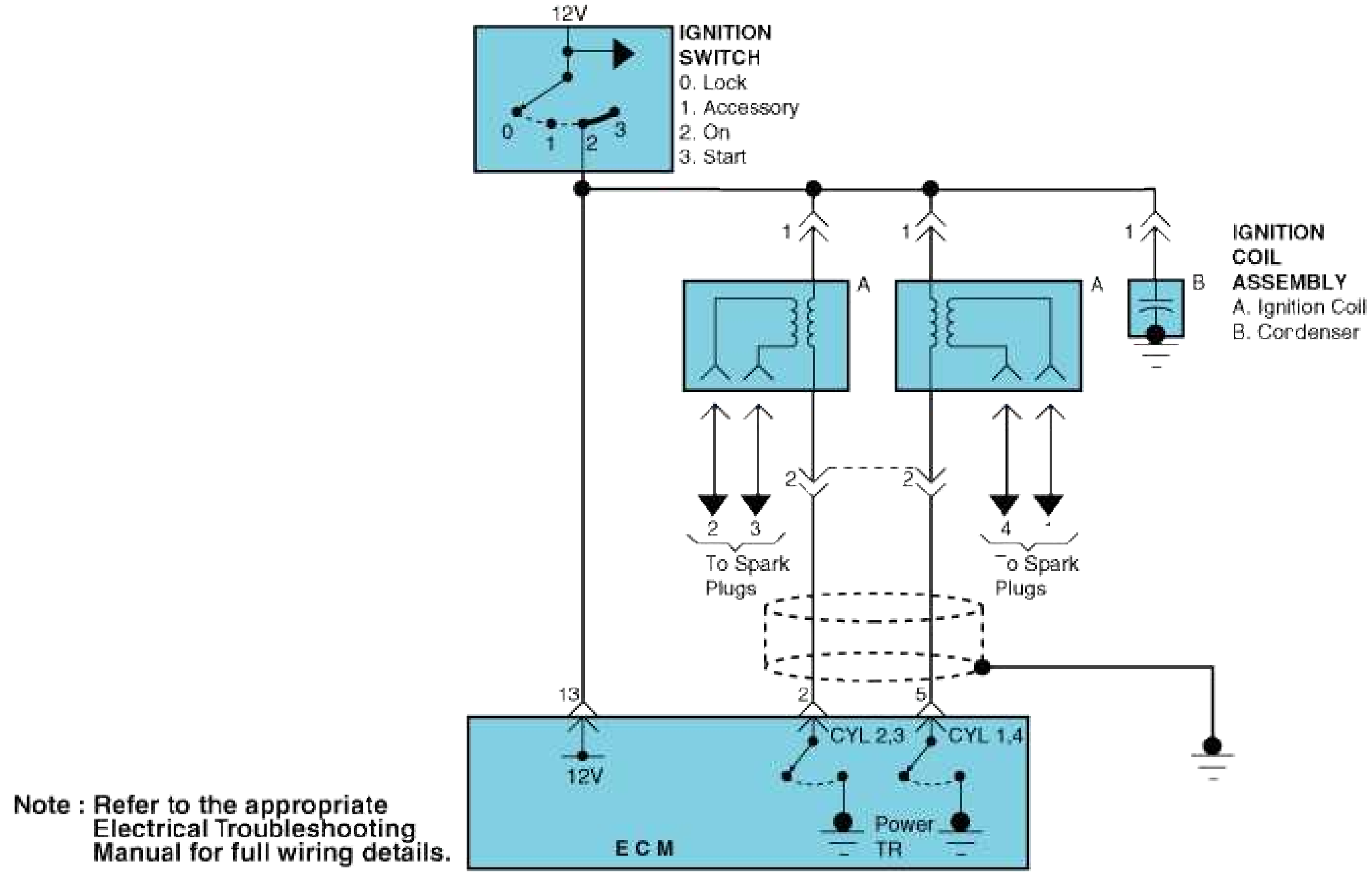
With the ignition switch at ON or START, voltage is applied to the ignition coil. The ignition coil consists of two coils. High tension leads go to each cylinder from the ignition coil. The ignition coil fires two spark plugs on every power stroke (the cylinder under compression and the cylinder on the exhaust stroke). Coil number one fires cylinders 1 and 4. Coil number two fires cylinders 2 and 3.

The Engine Control Module (ECM) provides a switching circuit to ground for energizing the primary ignition coils. The ECM uses the crankshaft position sensor signal to time the energizing of the coil. When a primary ignition coil is energized and de-energized, the secondary coil produces a high voltage spike across the attached spark plugs.

FAILURE CONDITIONS

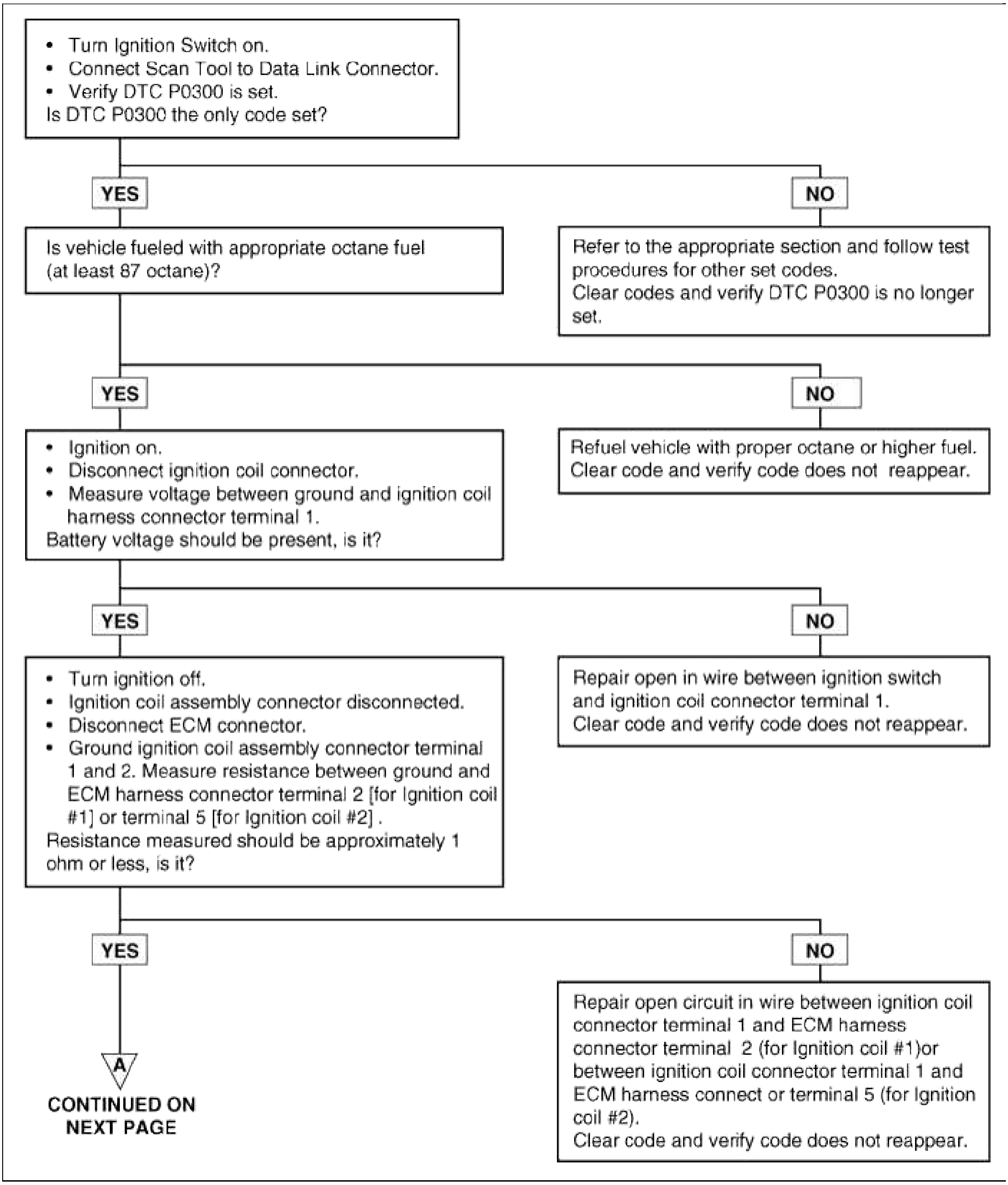
- Speed change is less than 1000 rpm per second.
- Engine speed is between 600 and 4000 RPM.
- Engine load is greater than 2 milliseconds.
- No fuel cut-off.
- Starter is not engaged.
- Vehicle on smooth road (acceleration sensor reports less than 0.3g acceleration).

CIRCUIT DIAGRAM


12V
IGNITION
SWITCH
0. Lock
1. Accessory
2. On
3. Start
0
1
2
3
1
1
1
A
A
B
IGNITION
COIL
ASSEMBLY
A. Ignition Coil
B. Condenser
2
2
2
3
To Spark
Plugs
4
To Spark
Plugs
13
2
5
12V
CYL 2,3
CYL 1,4
Power
TR
E C M

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn Ignition Switch on.
- Connect Scan Tool to Data Link Connector.
- Verify DTC P0300 is set.

Is DTC P0300 the only code set?

Is vehicle fueled with appropriate octane fuel (at least 87 octane)?

Refer to the appropriate section and follow test procedures for other set codes.
Clear codes and verify DTC P0300 is no longer set.

- Ignition on.
- Disconnect ignition coil connector.
- Measure voltage between ground and ignition coil harness connector terminal 1.

Battery voltage should be present, is it?

Refuel vehicle with proper octane or higher fuel.
Clear code and verify code does not reappear.

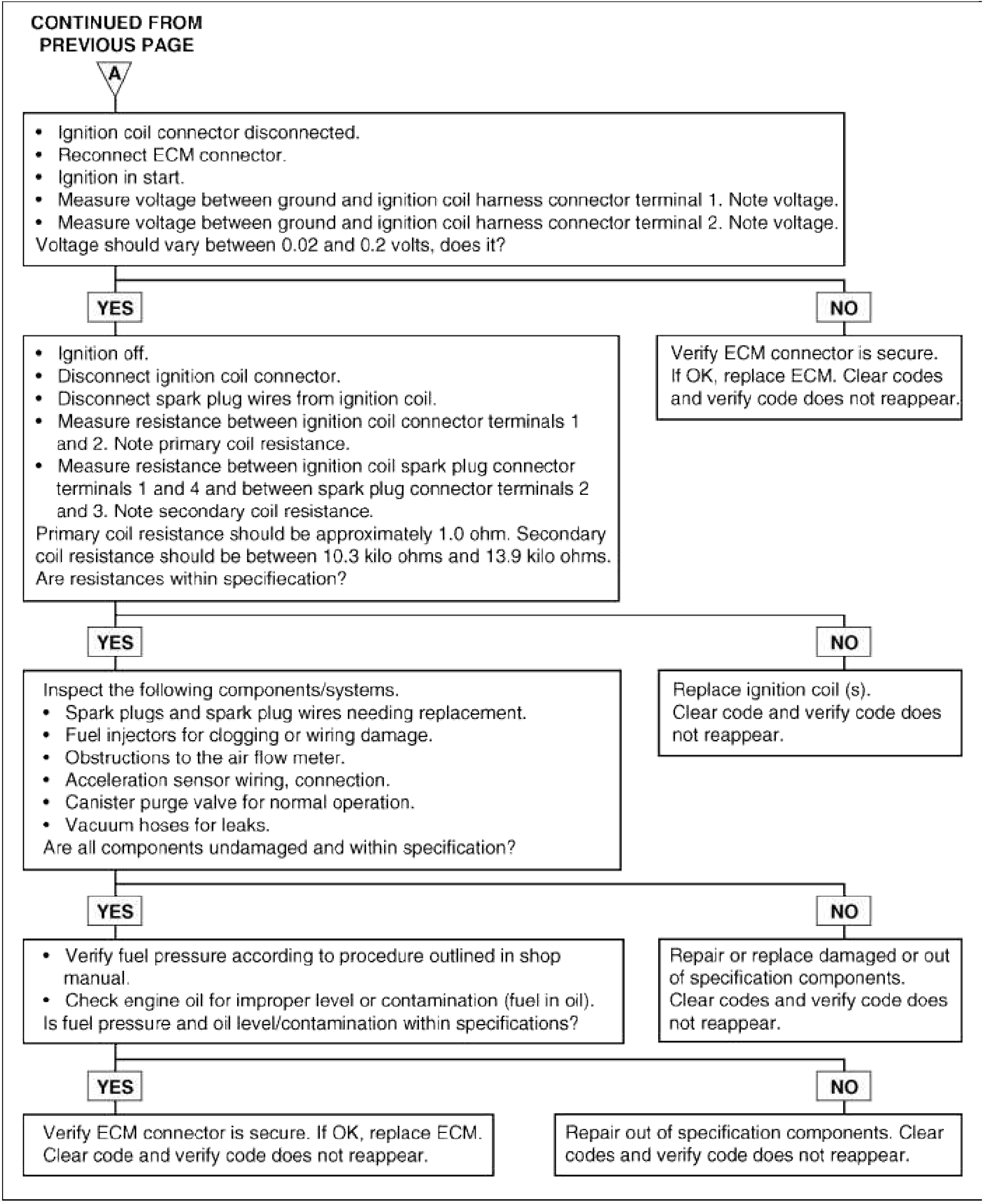
- Turn ignition off.
- Ignition coil assembly connector disconnected.
- Disconnect ECM connector.
- Ground ignition coil assembly connector terminal 1 and 2. Measure resistance between ground and ECM harness connector terminal 2 [for Ignition coil #1] or terminal 5 [for Ignition coil #2] .

Resistance measured should be approximately 1 ohm or less, is it?

Repair open in wire between ignition switch and ignition coil connector terminal 1.
Clear code and verify code does not reappear.

CONTINUED ON
NEXT PAGE

Repair open circuit in wire between ignition coil connector terminal 1 and ECM harness connector terminal 2 (for Ignition coil #1)or between ignition coil connector terminal 1 and ECM harness connect or terminal 5 (for Ignition coil #2).
Clear code and verify code does not reappear.



- Ignition coil connector disconnected.
- Reconnect ECM connector.
- Ignition in start.
- Measure voltage between ground and ignition coil harness connector terminal 1. Note voltage.
- Measure voltage between ground and ignition coil harness connector terminal 2. Note voltage.

Voltage should vary between 0.02 and 0.2 volts, does it?

YES:

- Ignition off.
- Disconnect ignition coil connector.
- Disconnect spark plug wires from ignition coil.
- Measure resistance between ignition coil connector terminals 1 and 2. Note primary coil resistance.
- Measure resistance between ignition coil spark plug connector terminals 1 and 4 and between spark plug connector terminals 2 and 3. Note secondary coil resistance.

Primary coil resistance should be approximately 1.0 ohm. Secondary coil resistance should be between 10.3 kilo ohms and 13.9 kilo ohms. Are resistances within specifiecation?

NO:

Verify ECM connector is secure. If OK, replace ECM. Clear codes and verify code does not reappear.

YES:

Inspect the following components/systems.

- Spark plugs and spark plug wires needing replacement.
- Fuel injectors for clogging or wiring damage.
- Obstructions to the air flow meter.
- Acceleration sensor wiring, connection.
- Canister purge valve for normal operation.
- Vacuum hoses for leaks.

Are all components undamaged and within specification?

NO:

Replace ignition coil (s). Clear code and verify code does not reappear.

YES:

- Verify fuel pressure according to procedure outlined in shop manual.
- Check engine oil for improper level or contamination (fuel in oil).

Is fuel pressure and oil level/contamination within specifications?

NO:

Repair or replace damaged or out of specification components. Clear codes and verify code does not reappear.

YES:

Verify ECM connector is secure. If OK, replace ECM. Clear code and verify code does not reappear.

NO:

Repair out of specification components. Clear codes and verify code does not reappear.

Engine Electrical System > Troubleshooting > P0301

[P0301/P0302/P0303/P0304]

DTC	Diagnostic item
P0301	Cylinder 1 Misfire Detected
P0302	Cylinder 2 Misfire Detected
P0303	Cylinder 3 Misfire Detected
P0304	Cylinder 4 Misfire Detected

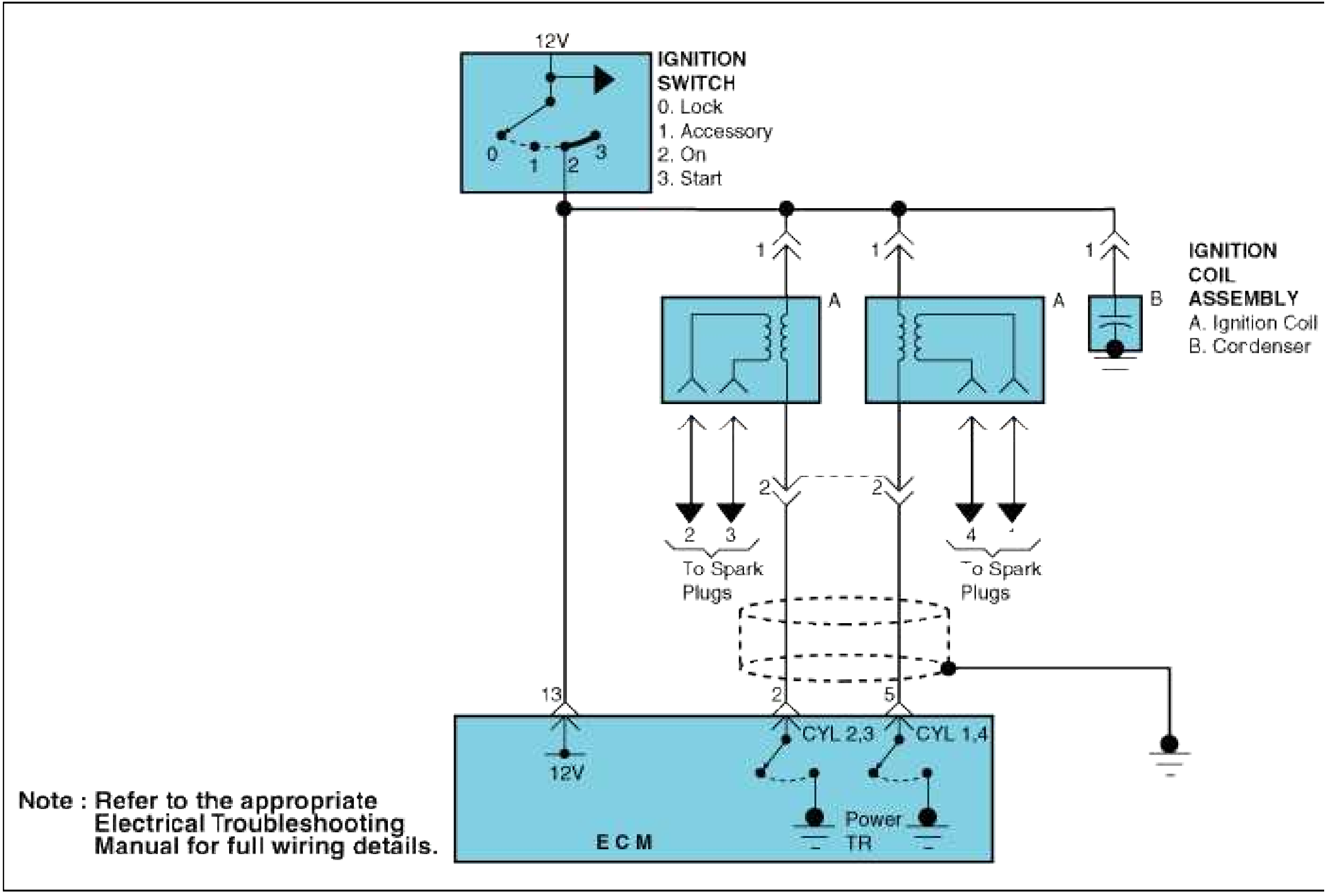
DESCRIPTION

Refer to DTC P0300.

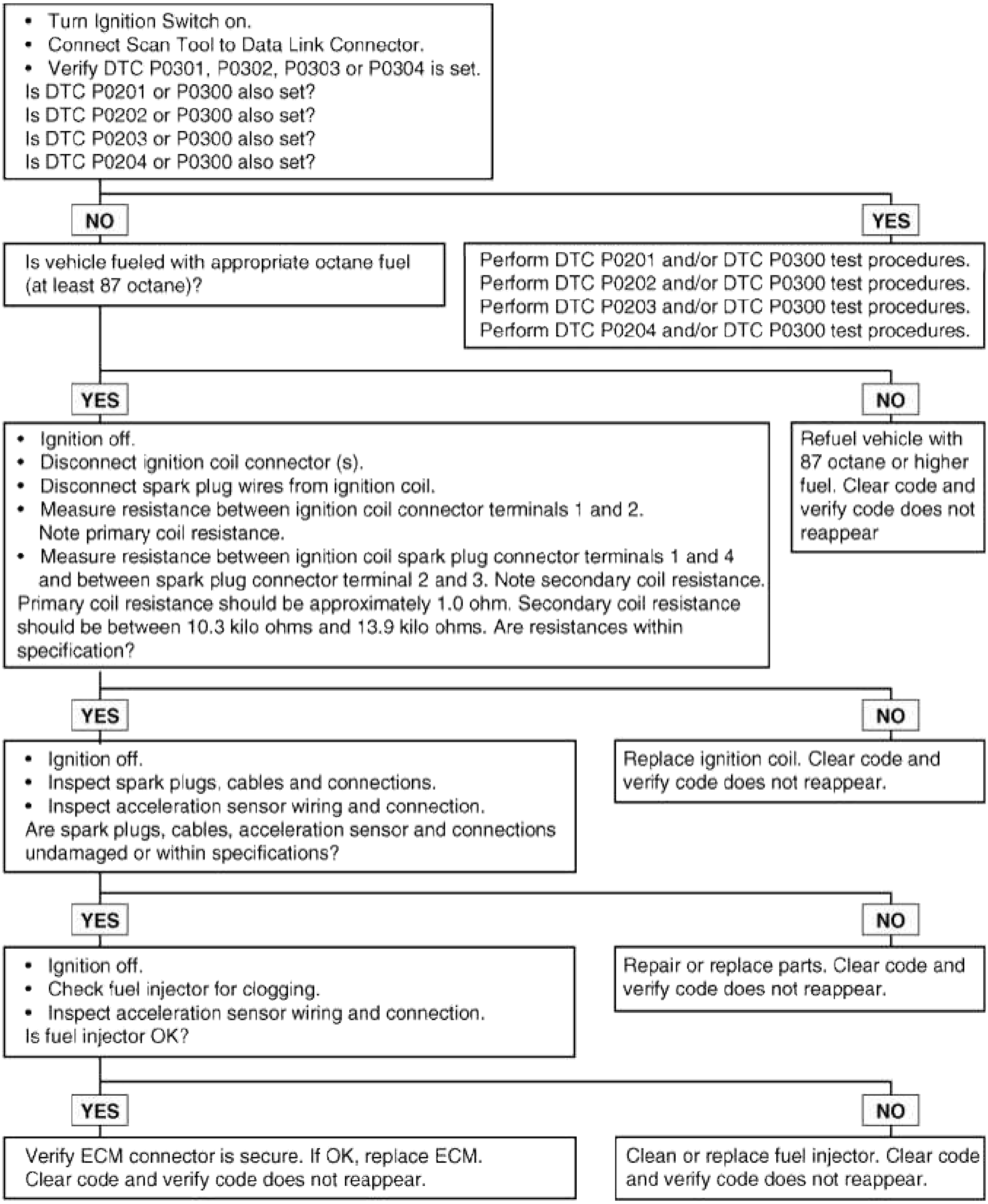
FAILURE CONDITIONS

- Speed change is less than 1000 rpm per second.
- Engine speed is between 600 and 4000 RPM.
- Engine load is greater than 2 milliseconds.
- No fuel cut-off.
- Starter is not engaged.
- Vehicle on smooth road (acceleration sensor reports less than 0.3g acceleration).

CIRCUIT DIAGRAM


12V
IGNITION SWITCH
0. Lock
1. Accessory
2. On
3. Start
0
1
2
3
1
1
1
A
A
B
IGNITION COIL ASSEMBLY
A. Ignition Coil
B. Condenser
2
2
2 3
To Spark Plugs
4
To Spark Plugs
13
2
5
CYL 2,3
CYL 1,4
12V
Power TR
ECM
Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn Ignition Switch on.
- Connect Scan Tool to Data Link Connector.
- Verify DTC P0301, P0302, P0303 or P0304 is set.

Is DTC P0201 or P0300 also set?
Is DTC P0202 or P0300 also set?
Is DTC P0203 or P0300 also set?
Is DTC P0204 or P0300 also set?

Is vehicle fueled with appropriate octane fuel (at least 87 octane)?

Perform DTC P0201 and/or DTC P0300 test procedures.
Perform DTC P0202 and/or DTC P0300 test procedures.
Perform DTC P0203 and/or DTC P0300 test procedures.
Perform DTC P0204 and/or DTC P0300 test procedures.

- Ignition off.
- Disconnect ignition coil connector (s).
- Disconnect spark plug wires from ignition coil.
- Measure resistance between ignition coil connector terminals 1 and 2. Note primary coil resistance.
- Measure resistance between ignition coil spark plug connector terminals 1 and 4 and between spark plug connector terminal 2 and 3. Note secondary coil resistance.

Primary coil resistance should be approximately 1.0 ohm. Secondary coil resistance should be between 10.3 kilo ohms and 13.9 kilo ohms. Are resistances within specification?

Refuel vehicle with 87 octane or higher fuel. Clear code and verify code does not reappear

- Ignition off.
- Inspect spark plugs, cables and connections.
- Inspect acceleration sensor wiring and connection.

Are spark plugs, cables, acceleration sensor and connections undamaged or within specifications?

Replace ignition coil. Clear code and verify code does not reappear.

- Ignition off.
- Check fuel injector for clogging.
- Inspect acceleration sensor wiring and connection.

Is fuel injector OK?

Repair or replace parts. Clear code and verify code does not reappear.

Verify ECM connector is secure. If OK, replace ECM. Clear code and verify code does not reappear.

Clean or replace fuel injector. Clear code and verify code does not reappear.

Engine Electrical System > Troubleshooting > P0302

[P0301/P0302/P0303/P0304]

DTC	Diagnostic item
P0301	Cylinder 1 Misfire Detected
P0302	Cylinder 2 Misfire Detected
P0303	Cylinder 3 Misfire Detected
P0304	Cylinder 4 Misfire Detected

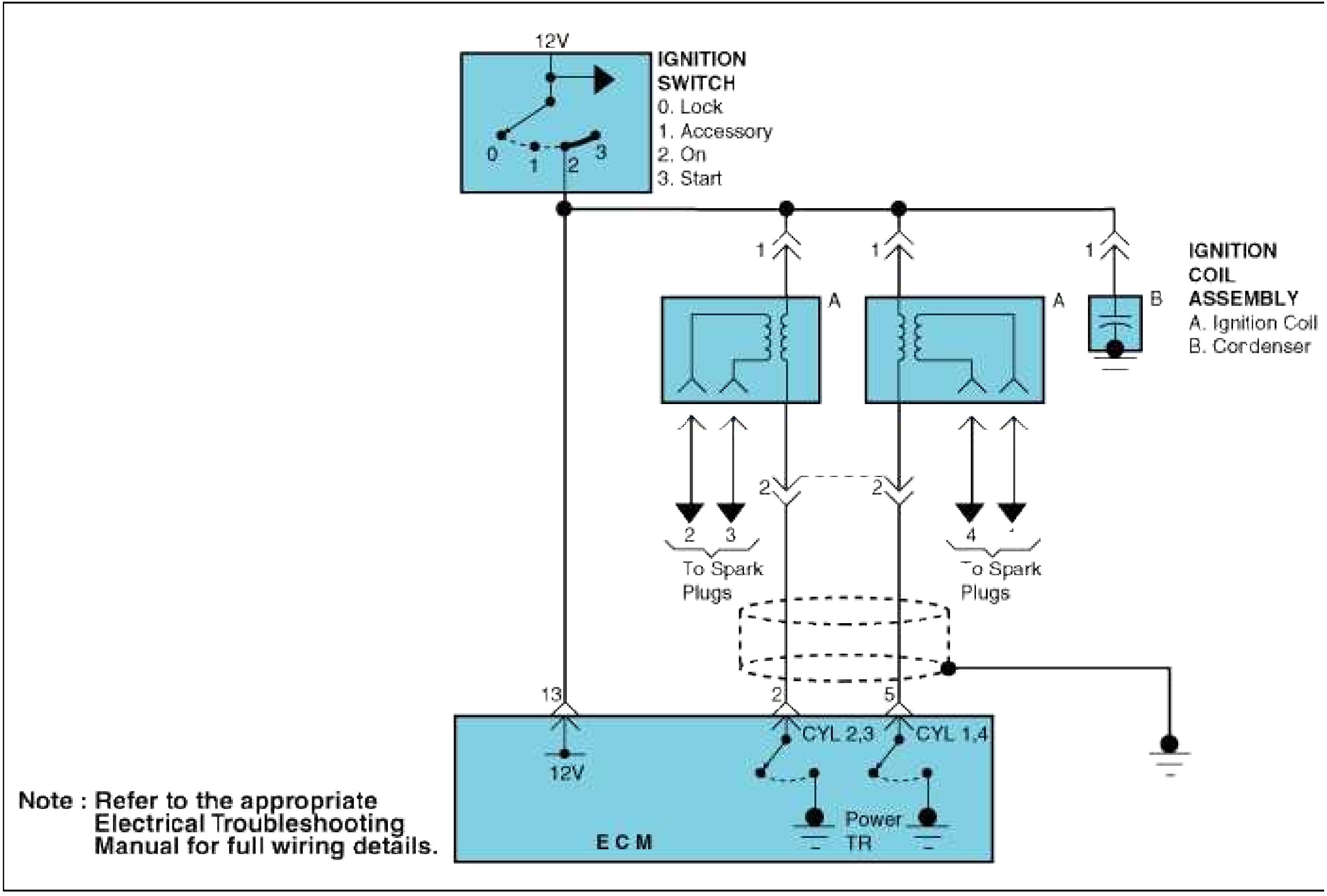
DESCRIPTION

Refer to DTC P0300.

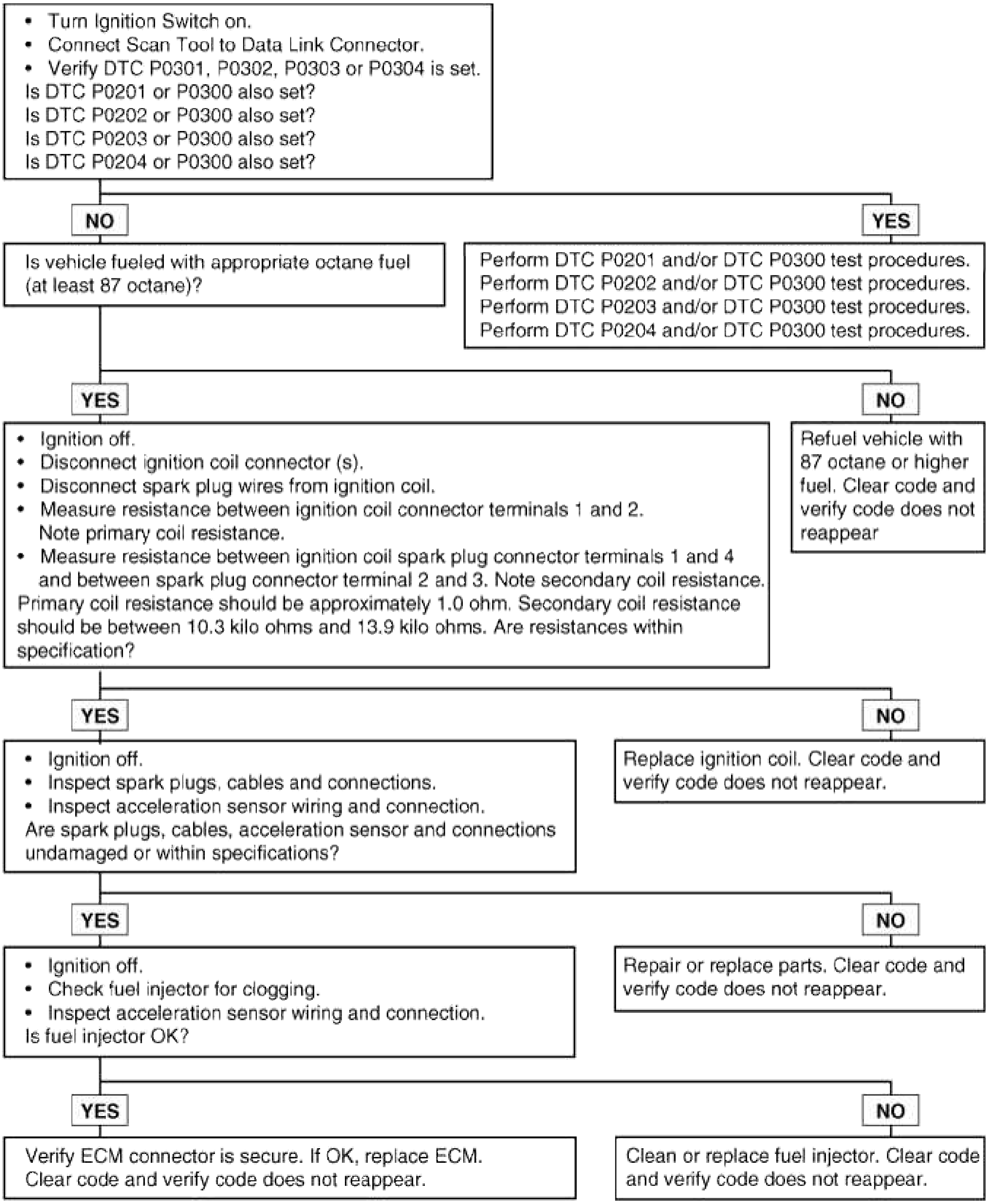
FAILURE CONDITIONS

- Speed change is less than 1000 rpm per second.
- Engine speed is between 600 and 4000 RPM.
- Engine load is greater than 2 milliseconds.
- No fuel cut-off.
- Starter is not engaged.
- Vehicle on smooth road (acceleration sensor reports less than 0.3g acceleration).

CIRCUIT DIAGRAM


12V
IGNITION SWITCH
0. Lock
1. Accessory
2. On
3. Start
0
1
2
3
1
1
1
A
A
B
IGNITION COIL ASSEMBLY
A. Ignition Coil
B. Condenser
2
2
2 3
To Spark Plugs
4
To Spark Plugs
13
2
5
12V
CYL 2,3
CYL 1,4
Power TR
ECM
Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn Ignition Switch on.
- Connect Scan Tool to Data Link Connector.
- Verify DTC P0301, P0302, P0303 or P0304 is set.

Is DTC P0201 or P0300 also set?
Is DTC P0202 or P0300 also set?
Is DTC P0203 or P0300 also set?
Is DTC P0204 or P0300 also set?

Is vehicle fueled with appropriate octane fuel (at least 87 octane)?

Perform DTC P0201 and/or DTC P0300 test procedures.
Perform DTC P0202 and/or DTC P0300 test procedures.
Perform DTC P0203 and/or DTC P0300 test procedures.
Perform DTC P0204 and/or DTC P0300 test procedures.

- Ignition off.
- Disconnect ignition coil connector (s).
- Disconnect spark plug wires from ignition coil.
- Measure resistance between ignition coil connector terminals 1 and 2. Note primary coil resistance.
- Measure resistance between ignition coil spark plug connector terminals 1 and 4 and between spark plug connector terminal 2 and 3. Note secondary coil resistance.

Primary coil resistance should be approximately 1.0 ohm. Secondary coil resistance should be between 10.3 kilo ohms and 13.9 kilo ohms. Are resistances within specification?

Refuel vehicle with 87 octane or higher fuel. Clear code and verify code does not reappear

- Ignition off.
- Inspect spark plugs, cables and connections.
- Inspect acceleration sensor wiring and connection.

Are spark plugs, cables, acceleration sensor and connections undamaged or within specifications?

Replace ignition coil. Clear code and verify code does not reappear.

- Ignition off.
- Check fuel injector for clogging.
- Inspect acceleration sensor wiring and connection.

Is fuel injector OK?

Repair or replace parts. Clear code and verify code does not reappear.

Verify ECM connector is secure. If OK, replace ECM. Clear code and verify code does not reappear.

Clean or replace fuel injector. Clear code and verify code does not reappear.

Engine Electrical System > Troubleshooting > P0303

[P0301/P0302/P0303/P0304]

DTC	Diagnostic item
P0301	Cylinder 1 Misfire Detected
P0302	Cylinder 2 Misfire Detected
P0303	Cylinder 3 Misfire Detected
P0304	Cylinder 4 Misfire Detected

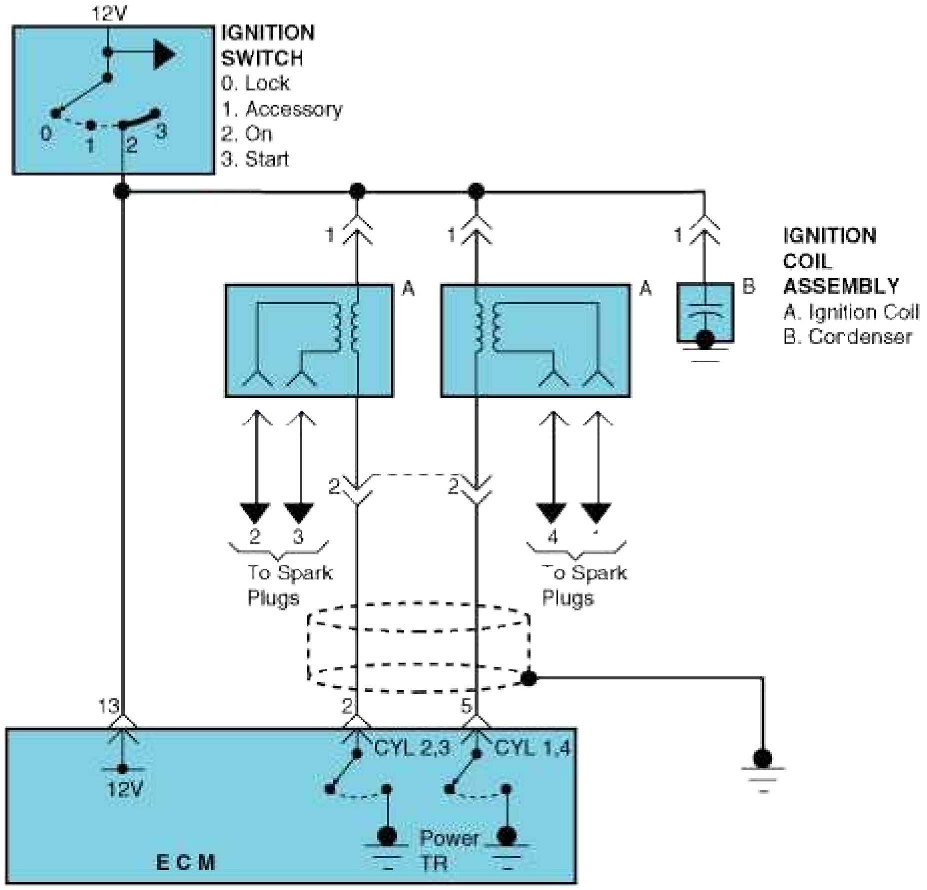
DESCRIPTION

Refer to DTC P0300.

FAILURE CONDITIONS

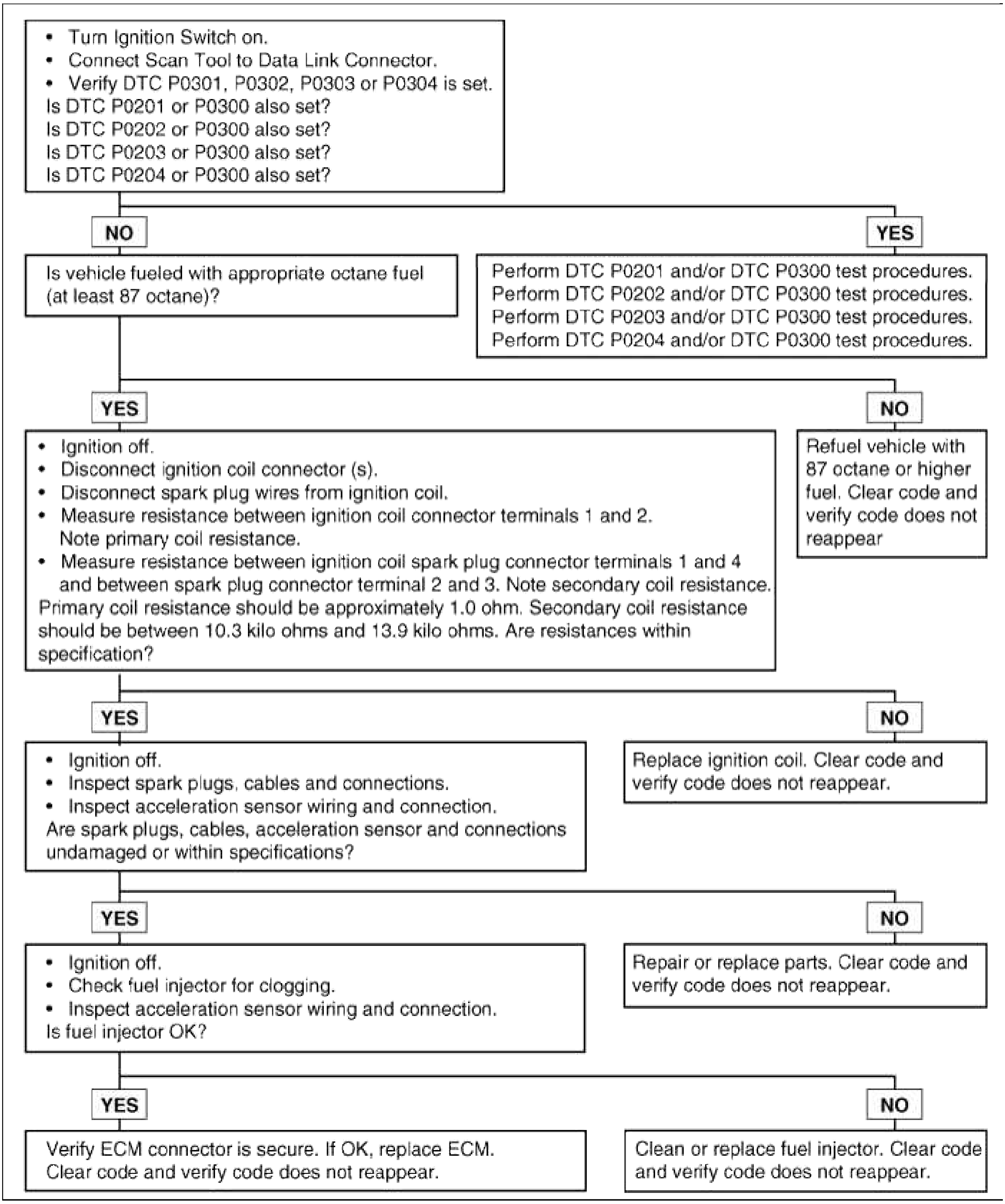
- Speed change is less than 1000 rpm per second.
- Engine speed is between 600 and 4000 RPM.
- Engine load is greater than 2 milliseconds.
- No fuel cut-off.
- Starter is not engaged.
- Vehicle on smooth road (acceleration sensor reports less than 0.3g acceleration).

CIRCUIT DIAGRAM


12V
IGNITION SWITCH
0. Lock
1. Accessory
2. On
3. Start
0
1
2
3
1
1
1
A
A
B
IGNITION COIL ASSEMBLY
A. Ignition Coil
B. Condenser
2
2
2
3
To Spark Plugs
4
To Spark Plugs
13
2
5
CYL 2,3
CYL 1,4
12V
E C M
Power TR

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn Ignition Switch on.
- Connect Scan Tool to Data Link Connector.
- Verify DTC P0301, P0302, P0303 or P0304 is set.

Is DTC P0201 or P0300 also set?
Is DTC P0202 or P0300 also set?
Is DTC P0203 or P0300 also set?
Is DTC P0204 or P0300 also set?

Is vehicle fueled with appropriate octane fuel (at least 87 octane)?

Perform DTC P0201 and/or DTC P0300 test procedures.
Perform DTC P0202 and/or DTC P0300 test procedures.
Perform DTC P0203 and/or DTC P0300 test procedures.
Perform DTC P0204 and/or DTC P0300 test procedures.

- Ignition off.
- Disconnect ignition coil connector (s).
- Disconnect spark plug wires from ignition coil.
- Measure resistance between ignition coil connector terminals 1 and 2. Note primary coil resistance.
- Measure resistance between ignition coil spark plug connector terminals 1 and 4 and between spark plug connector terminal 2 and 3. Note secondary coil resistance.

Primary coil resistance should be approximately 1.0 ohm. Secondary coil resistance should be between 10.3 kilo ohms and 13.9 kilo ohms. Are resistances within specification?

Refuel vehicle with 87 octane or higher fuel. Clear code and verify code does not reappear

- Ignition off.
- Inspect spark plugs, cables and connections.
- Inspect acceleration sensor wiring and connection.

Are spark plugs, cables, acceleration sensor and connections undamaged or within specifications?

Replace ignition coil. Clear code and verify code does not reappear.

- Ignition off.
- Check fuel injector for clogging.
- Inspect acceleration sensor wiring and connection.

Is fuel injector OK?

Repair or replace parts. Clear code and verify code does not reappear.

Verify ECM connector is secure. If OK, replace ECM. Clear code and verify code does not reappear.

Clean or replace fuel injector. Clear code and verify code does not reappear.

Engine Electrical System > Troubleshooting > P0304

[P0301/P0302/P0303/P0304]

DTC	Diagnostic item
P0301	Cylinder 1 Misfire Detected
P0302	Cylinder 2 Misfire Detected
P0303	Cylinder 3 Misfire Detected
P0304	Cylinder 4 Misfire Detected

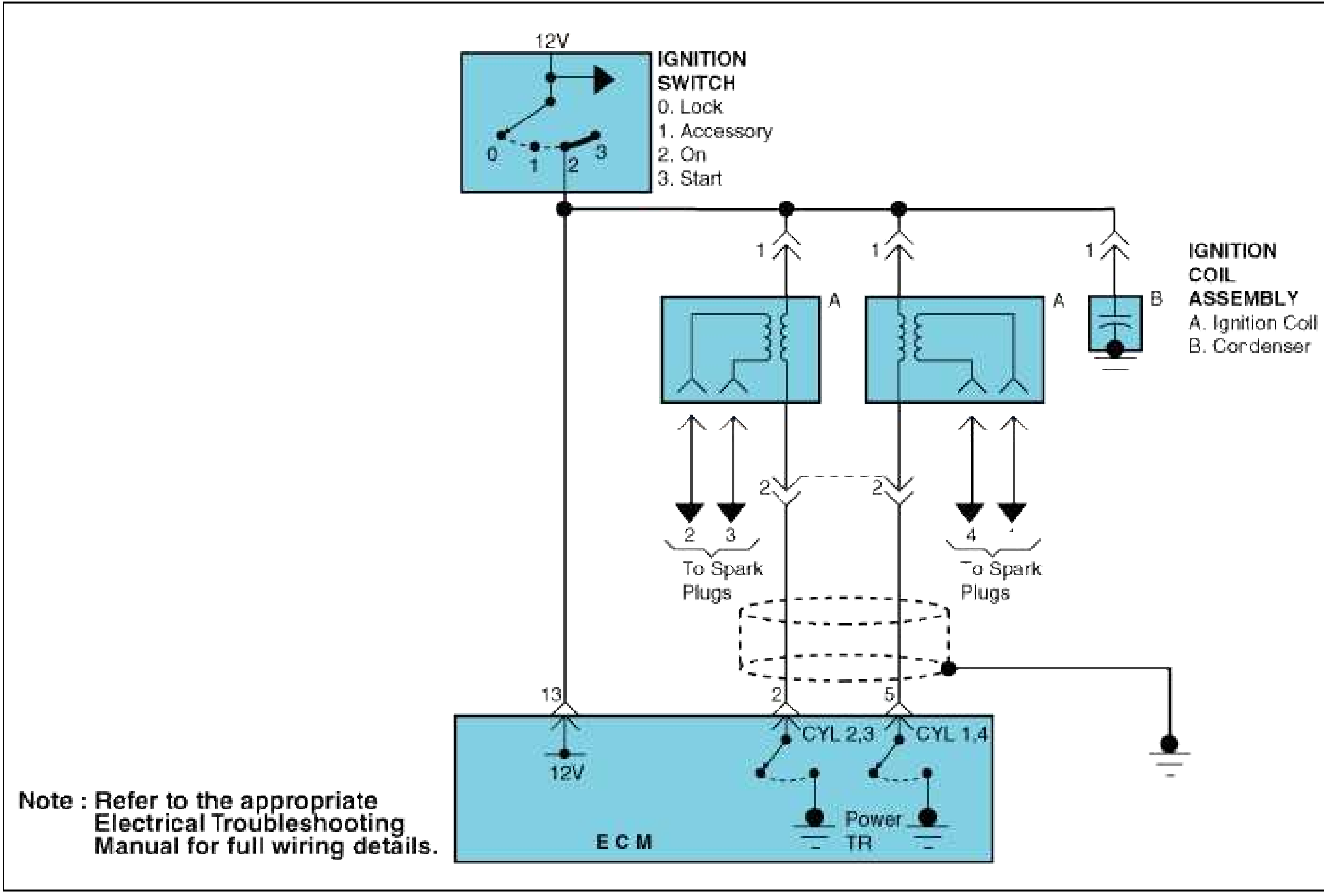
DESCRIPTION

Refer to DTC P0300.

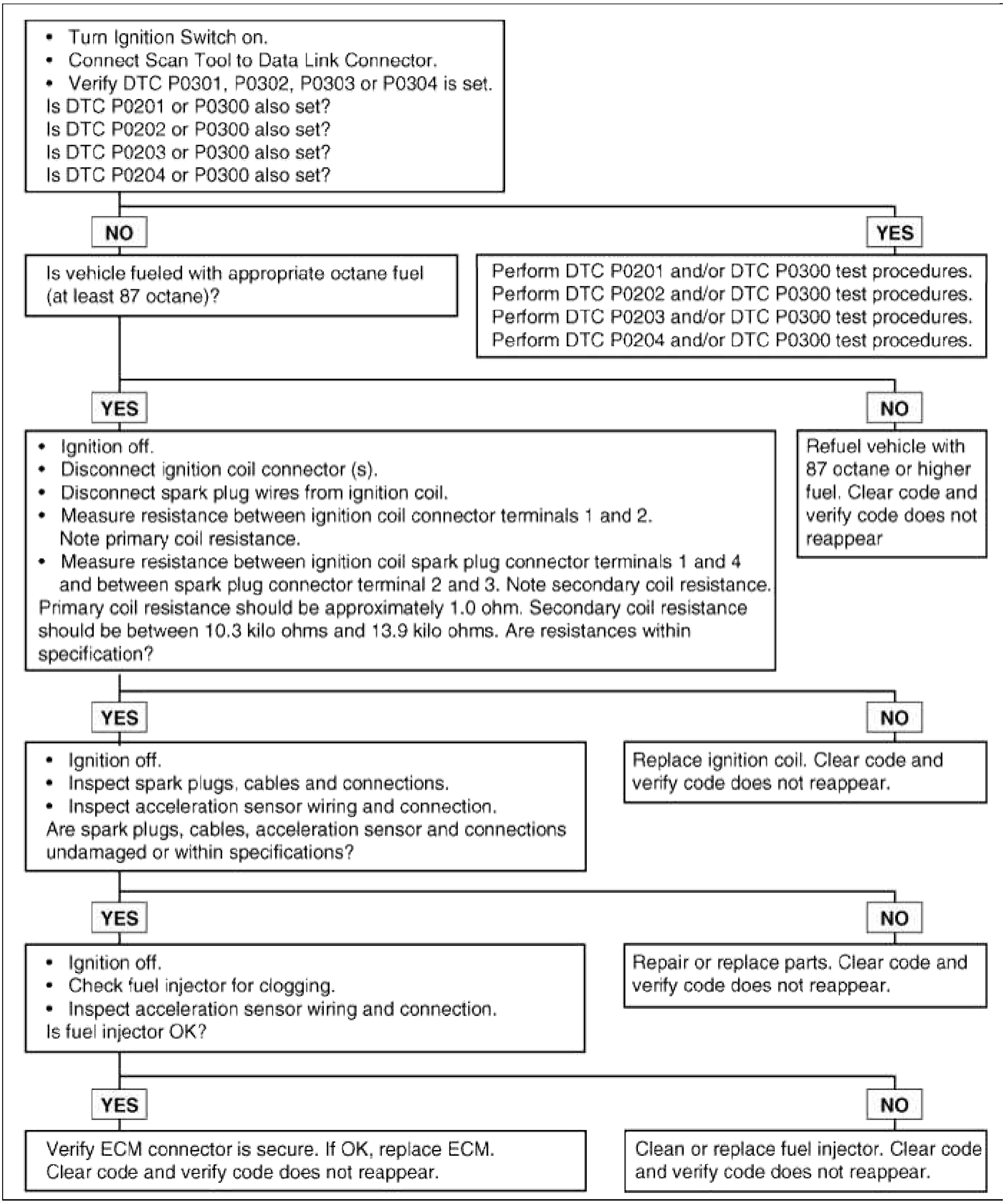
FAILURE CONDITIONS

- Speed change is less than 1000 rpm per second.
- Engine speed is between 600 and 4000 RPM.
- Engine load is greater than 2 milliseconds.
- No fuel cut-off.
- Starter is not engaged.
- Vehicle on smooth road (acceleration sensor reports less than 0.3g acceleration).

CIRCUIT DIAGRAM


12V
IGNITION SWITCH
0. Lock
1. Accessory
2. On
3. Start
0
1
2
3
1
1
1
A
A
B
IGNITION COIL ASSEMBLY
A. Ignition Coil
B. Condenser
2
2
2
3
To Spark Plugs
4
To Spark Plugs
13
2
5
CYL 2,3
CYL 1,4
12V
ECM
Power TR
Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn Ignition Switch on.
- Connect Scan Tool to Data Link Connector.
- Verify DTC P0301, P0302, P0303 or P0304 is set.

Is DTC P0201 or P0300 also set?
Is DTC P0202 or P0300 also set?
Is DTC P0203 or P0300 also set?
Is DTC P0204 or P0300 also set?

NO

Is vehicle fueled with appropriate octane fuel (at least 87 octane)?

YES

Perform DTC P0201 and/or DTC P0300 test procedures.
Perform DTC P0202 and/or DTC P0300 test procedures.
Perform DTC P0203 and/or DTC P0300 test procedures.
Perform DTC P0204 and/or DTC P0300 test procedures.

YES

- Ignition off.
- Disconnect ignition coil connector (s).
- Disconnect spark plug wires from ignition coil.
- Measure resistance between ignition coil connector terminals 1 and 2. Note primary coil resistance.
- Measure resistance between ignition coil spark plug connector terminals 1 and 4 and between spark plug connector terminal 2 and 3. Note secondary coil resistance.

Primary coil resistance should be approximately 1.0 ohm. Secondary coil resistance should be between 10.3 kilo ohms and 13.9 kilo ohms. Are resistances within specification?

NO

Refuel vehicle with 87 octane or higher fuel. Clear code and verify code does not reappear

YES

- Ignition off.
- Inspect spark plugs, cables and connections.
- Inspect acceleration sensor wiring and connection.

Are spark plugs, cables, acceleration sensor and connections undamaged or within specifications?

NO

Replace ignition coil. Clear code and verify code does not reappear.

YES

- Ignition off.
- Check fuel injector for clogging.
- Inspect acceleration sensor wiring and connection.

Is fuel injector OK?

NO

Repair or replace parts. Clear code and verify code does not reappear.

YES

Verify ECM connector is secure. If OK, replace ECM. Clear code and verify code does not reappear.

NO

Clean or replace fuel injector. Clear code and verify code does not reappear.

ACCENT(LC) > 2002 > G 1.5 SOHC > Engine Mechanical System

Engine Mechanical System > General Information > General Information

SPECIFICATIONS

	SPEC	LIMIT
General		
Type	In-line, SOHC	
No. of cylinder	4	
Bore	75.5 mm (2.97 in.)	
Stroke	83.5 mm (3.29 in.)	
Total displacement	1495 cc	
Compression ratio	10.0	
Firing order	1 - 3 - 4 - 2	
Valve timing		
Intake valve opens (BTDC)	12°	
Intake valve closes (ABDC)	52°	
Exhaust valve opens (BBDC)	52°	
Exhaust valve closes (ATDC)	12°	
Valve overlap	24°	
Cylinder head		
Flatness of gasket surface	Max. 0.03 mm (0.0012 in.)	0.08 mm (0.00315 in.)
Flatness of manifold mount'g surface	Max. 0.15 mm (0.0059 in.)	0.3 mm (0.0118 in.)
Dimension for reworking oversize valve seat hole		
Intake		
0.03 O.S.	28.8 ~ 28.821 mm (1.134 ~ 1.135 in.)	
0.06 O.S.	29.1 ~ 29.121 mm (1.146 ~ 1.1467 in.)	
Exhaust		
0.03 O.S.	34.3 ~ 34.325 mm (1.350 ~ 1.351 in.)	
0.06 O.S.	34.6 ~ 34.625 mm (1.362 ~ 1.363 in.)	
Valve guide hole diameter (intake/exhaust)		
0.05 O.S.	11.05 ~ 11.058 mm (0.435 ~ 0.436 in.)	
0.25 O.S.	11.25 ~ 11.258 mm (0.443 ~ 0.4436in.)	
0.50 O.S.	11.50 ~ 11.508 mm (0.453 ~ 0.4535in.)	
Camshaft		
Cam height intake	42.8575 mm (1.687 in.)	42.3575 mm (1.667 in.)
Cam height exhaust	42.7354 mm (1.682 in.)	42.2624 mm (1.664 in.)
Journal diameter	30 mm (1.181 in.)	
Bearing oil clearance	0.045 ~ 0.085 mm (0.0018 ~ 0.0033 in.)	
End play	0.07 ~ 0.28 mm (0.0027 ~ 0.011 in.)	
Crankshaft		
Journal diameter	50 mm (1.97 in.)	
Pin diameter	45 mm (1.77 in.)	
Bend	0.03 mm (0.0018 in.)	
Out of roundness of journal and pin	Max. 0.005	
Taper of journal and pin	Max. 0.005	
End play	0.05 ~ 0.175 mm (0.002 ~ 0.007 in.)	0.25 mm (0.0098 in.)

Undersize of Pin		
0.25	44.725 ~ 44.740 mm (1.76 ~ 1.761 in.)	
0.50	44.475 ~ 44.490 mm (1.75 ~ 1.751 in.)	
0.75	44.225 ~ 44.240 mm (1.74 ~ 1.741 in.)	
Undersize of Journal		
0.25	49.727 ~ 49.742 mm (1.957 ~ 1.958in.)	
0.50	49.477 ~ 49.492 mm (1.948 ~ 1.9485in.)	
0.75	49.227 ~ 49.242 mm (1.938 ~ 1.9386in.)	
Main bearing oil clearance		
No. 1,2,4,5	0.028 ~ 0.046 mm (0.0011 ~ 0.0018 in.)	0.1 mm (0.00394 in.)
No. 3.	0.034 ~ 0.052 mm (0.0013 ~ 0.002 in.)	
Valve		
Stem diameter		
Intake	5.955 ~ 5.97 mm (0.234 ~ 0.235 in.)	
Exhaust	5.935 ~ 5.95 mm (0.2336 ~ 0.234 in.)	
Face angle	45° ~ 45.5°	
Thickness of valve head (margin)		
Intake	1.1 mm (0.043 in.)	0.8mm (0.031in.)
Exhaust	1.4 mm (0.055 in.)	1.1 mm (0.043 in.)
Valve stem to valve guide clearance		
Intake	0.03 ~ 0.06 mm (0.0012 ~ 0.0024 in.)	0.1 mm (0.0039 in.)
Exhaust	0.035 ~ 0.065 mm (0.0014 ~ 0.0026 in.)	0.15 mm (0.006 in.)
Valve guide		
Length		
Intake	12.8 mm (0.504 in.)	
Exhaust	12.8 mm (0.504 in.)	
Service oversize	0.05, 0.25, 0.50	
Valve seat		
Width of seat contact		
Intake	0.8 ~ 1.2 mm (0.031 ~ 0.047 in.)	
Exhaust	1.3 ~ 1.7mm (0.051 ~ 0.067 in.)	
Seat angle	45°	
Service oversize	0.3, 0.6	
Valve spring		
Free length (Installed height)	42.03 mm (1.655 in.)	
Load	24.7 kg / 34.5 mm	
Out of squareness	Max 1.5	
Cylinder block		
Cylinder bore	75.5 ~ 75.53 mm (2.9724 ~ 2.9736 in.)	
Out of roundness of cylinder bore	Max. 0.01	
Taper of cylinder bore	-	
Flatness of gasket surface	Max. 0.05	0.1 mm (0.0039 in.)
Piston		
Dameter	75.47 ~ 75.50 mm (2.9713 ~ 2.9724 in)	
Piston to cylinder clearance	0.02 ~ 0.04 mm (0.0078 ~ 0.00157 in.)	
Piston ring		

No. of rings per piston	3	
Compression ring	2	
Oil ring	1	
Compression ring type		
No. 1	Inside bevel type, steel	
No. 2	Taper type	
Oil ring type	3-piece type	
Side clearance		
No. 1	0.04 ~ 0.085 mm (0.0016 ~ 0.0033 in.)	0.1 mm (0.00394 in.)
No. 2	0.04 ~ 0.085 mm (0.0016 ~ 0.0033 in.)	0.1 mm (0.00394 in.)
Oil ring	0.06 ~ 0.15 mm (0.0023 ~ 0.006 in.)	
End gap		
No. 1	0.20 ~ 0.35 mm (0.0079 ~ 0.0138 in.)	1 mm (0.0394 in.)
No. 2	0.37 ~ 0.52 mm (0.015 ~ 0.02 in.)	1 mm (0.0394 in.)
Oil ring side rail	0.2 ~ 0.7 mm (0.008 ~ 0.028 in.)	1 mm (0.0394 in.)
Sevice oversize	0.25, 0.50, 0.75, 1.0	
Connecting rod		
Bend	Max. 0.05 per 100 mm	
Twist	Max. 0.1 per 100mm	
Connecting rod big end to crankshaft side clearance	0.10 ~ 0.25 mm (0.004 ~ 0.01 in.)	0.4mm(0.016in.)
Piston pin press in load	1250 ± 500 kg	
Bearing oil clearance	0.018 ~ 0.036 mm (0.0007 ~ 0.0014 in.)	0.1mm(0.0039in.)
Flywheel		
Runout	0.1mm (0.0014 in.)	0.13mm (0.005in.)
Oil pressure at curb idle speed (oil temp. 90~110°C)	1.5kg/cm^2	
Oil pump		
Clearance between outer circum ference and front	0.12 ~ 0.18 mm (0.0047 ~ 0.0071 in.)	
Clearance between roter axial side and front case	0.04 ~ 0.087 mm (0.0016 ~ 0.0034 in.)	
Tip clearance between outer and inner roter	0.025 ~ 0.069 mm (0.0010 ~ 0.0027 in.)	
Relief spring		
Free length	46.6 mm (1.8346 in.)	
Load	6.1kg at 40.1 mm (13.4216 at 1.578 in.)	
Cooling method	Water-cooled, Pressurized, Forced circulation with electrical fan	
Cooling sys. Quantity	6.5 lit (6.87 U.S. qut, 5.72 lmp qts)	
Thermostat		
Type	Wax pellet type with jiggle valve	
Normal opening temp.	82°C	
Opening temp. range	80.5 ~ 83.5°C	
Wide opening temp.	95°C	

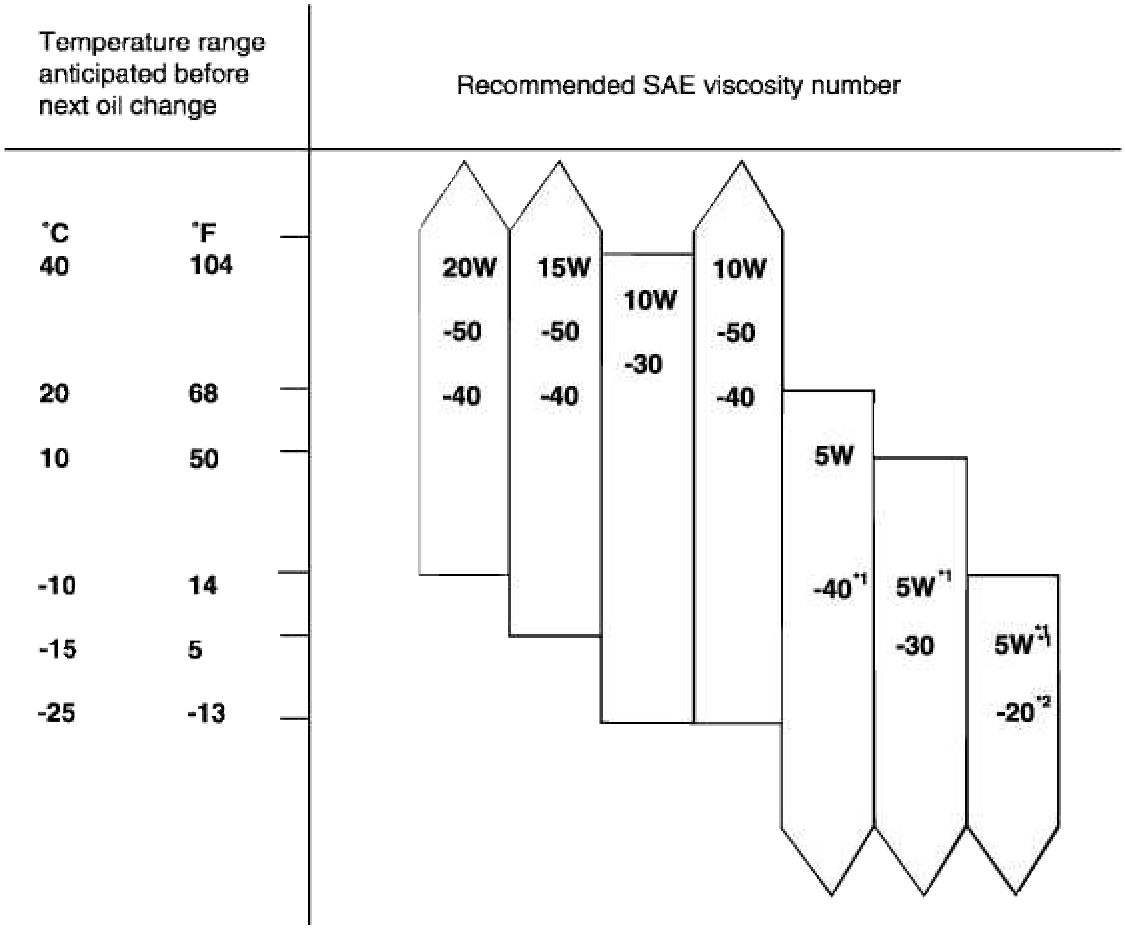
Radiator cap		
Main valve opening pressure	86.1 ~ 124.5 kpa	
Main valve colseing pressure	83.4 kpa	
Vacuum valve opening preesur	-86.6 kpa	
Air cleaner		
Type	Dry type	
Element	Unwoven cloth type	
Exhaust pipe		
Muffler	Expansion resonance type	
Suspension sys.	Rubber hanger type	

TIGHTENING TORQUE

Item	Nm	kg.cm	lb.ft
Cylinder Block			
Left engine support bracket bolt	30 ~ 42	300 ~ 420	22 ~ 31
Oil pressure switch	13 ~ 15	130 ~ 150	9.6 ~ 11
Cylinder head			
Cylinder head bolt	(23 ~ 27) + (60 + 45°)	(230 ~ 270) + (60° + 45°)	(17 ~ 20) + (60° + 45°)
Intake/manifold bolts or nuts	15 ~ 20	150 ~ 200	11 ~ 15
Exhaust manifold nut	15 ~ 20	150 ~ 200	11 ~ 15
Recker cover bolt	8 ~ 10	80 ~ 100	6 ~ 7
Recker arm shaft bolt	20 ~ 27	200 ~ 270	15 ~ 18
Camshaft bolt	20 ~ 27	200 ~ 270	15 ~ 20
Rear plate bolt	8 ~ 10	80 ~ 100	6 ~ 7
Main Moving parts			
Connecting rod cap nut	32 ~ 35	320 ~ 350	24 ~ 26
Crankshaft bearing cap bolt	55 ~ 60	550 ~ 600	41 ~ 44
Flywheel M/T bolt	130 ~ 140	1300 ~ 1400	96 ~ 103
Drive plate A/T bolt	130 ~ 140	1300 ~ 1400	96 ~ 103
Timing Belt			
Crankshaft sprocket bolt	140 ~ 150	1400 ~ 1500	103 ~ 111
Camshaft sprocket bolt	80 ~ 100	800 ~ 1000	59 ~ 74
Timing belt tensioner bolt	20 ~ 27	200 ~ 270	15 ~ 20
Timing belt cover bolt	10 ~ 12	100 ~ 120	7 ~ 9
Front case bolt	12 ~ 15	120 ~ 150	9 ~ 11
Engine Mounting			
Engine mounting insulator bolt	90 ~ 110	900 ~ 1100	66.4 ~ 81.1
Engine mounting bracket to engine nuts and bolts	50 ~ 65	500 ~ 650	36.9 ~ 48.0
Transaxle mount insulator bolt			
Transaxle insulator bracket to side member bolts	90 ~ 110	900 ~ 1100	66.4 ~ 81.1
Front roll stoper insulator bolt	30 ~ 40	300 ~ 400	22.1 ~ 29.5
Front roll stoper bracket to sub-frame bolt			
Rear roll stoper insulator bolt	45 ~ 60	450 ~ 600	33.2 ~ 44.3
Rear roll stoper bracket to sub-frame bolt	30 ~ 40	300 ~ 400	22.1 ~ 29.5
	45 ~ 60	4520 ~ 600	33.2 ~ 44.3
	30 ~ 40	300 ~ 400	22.1 ~ 29.5

Oil filter	12 ~ 16	120 ~ 160	9 ~ 12
Oil pan bolts	6 ~ 8	60 ~ 80	4 ~ 6
Oil pan drain plug	35 ~ 45	350 ~ 450	26 ~ 33
Oil screen bolts	15 ~ 22	150 ~ 220	11 ~ 16
Timing belt upper cover bolts	10 ~ 12	100 ~ 120	7 ~ 9
Timing belt lower cover bolts	10 ~ 12	100 ~ 120	7 ~ 9
Surge tank to inlet manifold nuts and bolts	15 ~ 20	150 ~ 200	11 ~ 15
Alternator support and nut	20 ~ 25	200 ~ 250	15 ~ 18
Alternator lock bolt	15 ~ 22	150 ~ 220	11 ~ 16
Alternator brace mounting bolt	20 ~ 28	200 ~ 280	15 ~ 21
Cooling system			
Coolant pump pulley	8 ~ 10	80 ~ 100	6 ~ 7
Coolant pump bolt	12 ~ 15	120 ~ 150	9 ~ 11
Coolant temperature gauge unit	10 ~ 12	100 ~ 120	7 ~ 9
Coolant temperature sensor	15 ~ 20	150 ~ 200	11 ~ 15
Coolant outlet fitting bolt	17 ~ 20	170 ~ 200	13 ~ 15
Thermostat housing bolt	15 ~ 20	150 ~ 200	11 ~ 15
Intake and Exhaust system			
Air cleaner body mounting bolts	8 ~ 10	80 ~ 100	6 ~ 7
Resonator mounting bolts	4 ~ 6	40 ~ 60	2.9 ~ 4.3
Throttle body to surge tank bolts	15 ~ 20	150 ~ 200	11 ~ 15
Oxygen sensor to exhaust manifold	50 ~ 60	500 ~ 600	37 ~ 44
Front exhaust pipe to exhaust manifold nuts	30 ~ 40	300 ~ 400	22 ~ 30
Front exhaust pipe bracket bolts	30 ~ 40	300 ~ 400	22 ~ 30
Front exhaust pipe to cataiytic converter bolts	40 ~ 60	400 ~ 600	30 ~ 44

SELECTION OF ENGINE OIL



*1 Restricted by driving condition and environment.
*2 SAE5W-20 Not recommended for sustained high speed vehicle operation

NOTE

For best performance and maximum protection of all types of operation, select only those lubricants which:

1. Satisfy the requirements of the API classification.
2. Have proper SAE grade number for expected ambient temperature range.

Lubricant that does not have both an SAE grade number and an API service classification on the container should not be used.

MAINTENCE

CHECKING ENGINE OIL

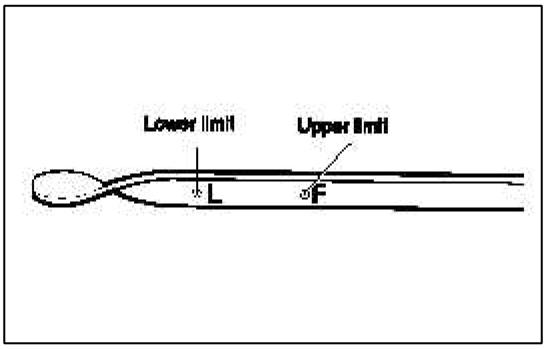
1. Position the vehicle on a level surface.
2. Warm up the engine.

NOTE

If a vehicle has been out of service for a prolonged period of time, warm up the engine for approximately 20 minutes.

3. Turn off the engine, and wait 2 or 3 minutes, then check the oil level.

4. Check that the engine oil level is within the level range indicated on the oil dipstick if the oil level is found to have fallen to the lower limit (the "L" mark), refill to the "F" mark.



NOTE

When refilling, use the same type of engine oil.

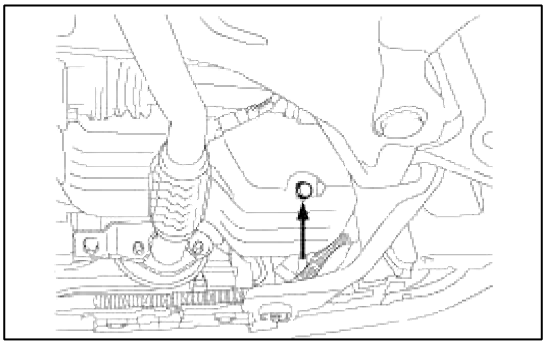
5. Check that the oil is not dirty or contaminated with coolant or gasoline and that it has proper viscosity.

CHANGING ENGINE OIL

WARNING

Be careful not to burn yourself, the engine oil is hot.

1. Run the enigne until it reaches normal operating temperature.
2. Turn off the engine.
3. Remove the oil filler cap and the engine oil drain plug. Drain the engine oil.



4. Install and tighten the drain plug to the specified torque.

Tightening torque
Drain plug : 35 ~ 45 Nm (350 ~ 450 kg.cm, 24 ~ 33 lb.ft)

NOTE

Whenever tightening the oil drain plug, use a new drain plug gasket.

5. Fill the crankcase with fresh engine oil through the oil filler cap opening.

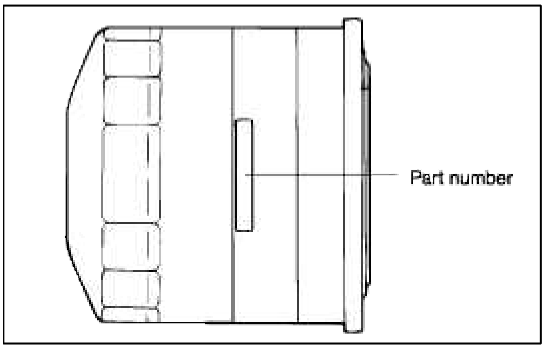
Drain and Refill Without oil filter :
3.0 liter (3.17 U.S. qts., 2.64 lmp. qts.)
Drain and Refill With oil filter :
3.3 liter (3.48 U.S. qts., 2.90 lmp. qts.)

---

6. Install the oil filler cap.
7. Start and run the engine.
8. Turn off the engine and then check the oil level. Add oil if necessary.

FILTER SELECTION

All Hyundai engines are dquipped with a high quality, disposable oil filter. This filter is recommended as a replacement filter on all vehicles. The quality of replacement filters varies considerably. Only high quality filters should be used to assure the most efficient service. Make sure that the rubber gasket from the old oil filter is completely removed from the contact surface on the engine block be fore installing the new filter.

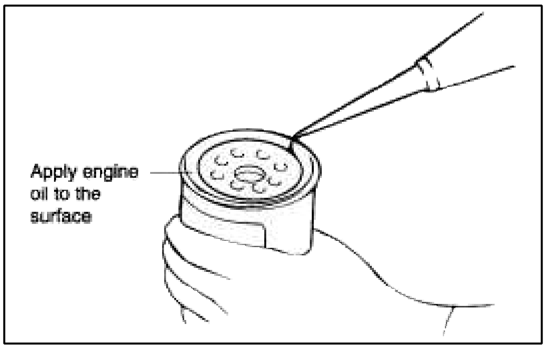


PROCEDURE FOR REPLACING THE OIL FILTER

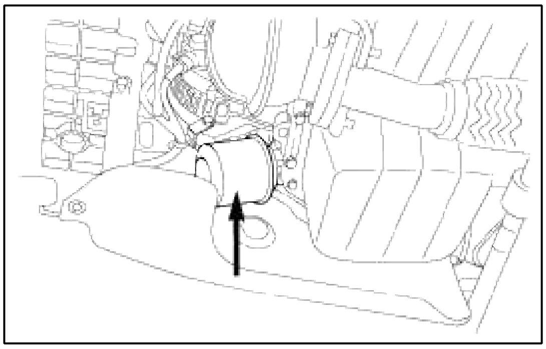
CAUTION

Be careful not to burn yourself, the engine and engine oil are hot.

1. Use a filter wrench to remove the oil filter.
2. Before installing the new oil filter on the engine clean oil filter sealing baseplate with shop towel.



3. Tighten the oil filter to the specified torque.



Tightening torque

Oil filter : 12 ~ 16 Nm (120 ~ 160 kg.cm, 9 ~ 12 lb.ft)

4. Run the engine to check for engine oil leaks.
5. After turning off the engine, check the oil level and add oil as necessary.

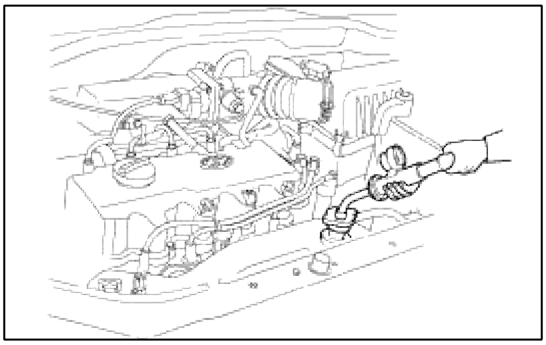
CHECKING COOLANT LEAK

1. Wait until the engine is cool, then carefully remove the radiator cap.
2. Confirm that the coolant level is up to the filler neck.

3. Install a radiator cap tester to the radiator filler neck and apply 140 KPa (1.4 kg/cm², 20 psi) pressure. Hold it for two minutes in that condition, while checking for leakage from the radiator, hoses or connections.

> **NOTE**
>
> 1. Radiator coolant may be extremely hot. Do not open the system because hot, or scalding water could gush out causing personal injury. Allow the vehicle to cool before servicing this system.
> 2. Be sure to clean away any moisture from the places checked completely.
> 3. When the tester is removed, be careful not to spill any coolant.
> 4. Be careful when installing and removing the tester and when testing do not deform the filler neck of the radiator.

4. If there is leakage, repair or replace with the apropriate part.



RADIATOR CAP PRESSURE TEST

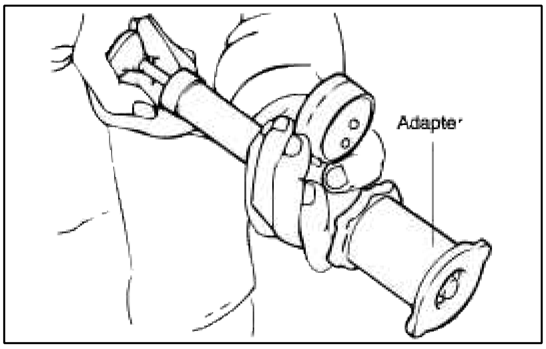
1. Remove the radiator cap. Wet its seal with engine coolant, then install it on the tester.
2. Increase the pressure until the gauge stops moving.

Main valve opening pressure :
78 ~ 108 kPa (0.8 ~ 1.1 kg/cm², 11.3 ~ 15.6 psi)
Limit : 65 kPa (0.66 kg/cm², 9.2 psi)

---

3. Check that the pressure level is maintained at or above the limit.
4. Replace the radiator cap if the reading does not remain at or above the limit.

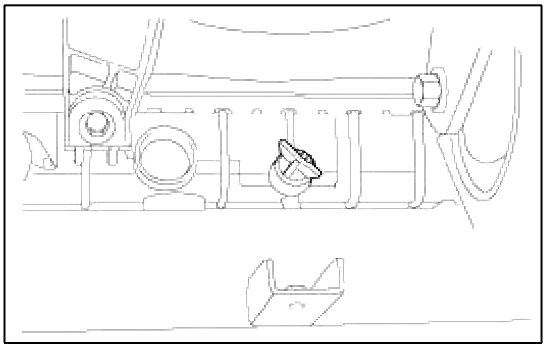
> **NOTE**
>
> Be sure that the cap is clean before testing. Rust or other foreign material on the cap seal will cause an incorrect reading.



CHANGING ENGINE COOLANT

> **CAUTION**
>
> When pouring engine coolant, be sure to shut the relay box lid and not to let coolant spill on electrical parts or the paint. If any coolant spills, rinse it off immediately.

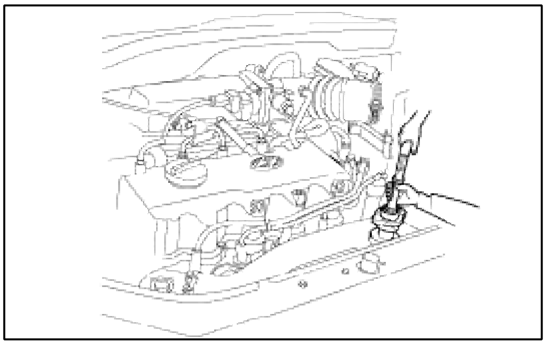
1. Slide the heater temperature control lever to maximum heat. Make sure the engine and radiator are cool to the touch.
2. Remove the radiator cap.
3. Loosen the drain plug and drain the coolant.



4. Tighten the radiator drain plug securely.
5. Remove, drain and reinstall the reservior.
   Fill the tank halfway to the MAX mark with water, then up to the MAX mark with antifreeze.
6. Pour coolant into the radiator up to the base of the filler neck, and install the radiator cap loosely.
7. Start the engine and let it run until it warms up (the radiator fan comes on at least twice)
8. Turn off the engine. Check the level in the radiator, add coolant if needed.
9. Put the radiator cap on tightly, then run the engine again and check for leaks.

SPECIFIC GRAVITY TEST

1. Measure the specific gravity of the coolant with a hydrometer.
2. Measure the coolant temperature and calculate the concentration from the relation between the specific gravity and temperature, using the following table for reference.



RELATION BETWEEN COOLANT CONCENTRATION AND SPECIFIC GRAVITY

Coolant temperature °C (°F) and specific gravity					Freezing temperature °C (°F)	Safe operating temperature °C (°F)	Coolant concentration (Specific volume)
10 (50)	20 (68)	30 (86)	40 (104)	50 (122)			
1.054	1.050	1.046	1.042	1.036	-16 (3.2)	-11 (12.2)	30%
1.063	1.058	1.054	1.049	1.044	-20 (-4)	-15 (5)	35%
1.071	1.067	1.062	1.057	1.052	-25 (-13)	-20 (-4)	40%
1.079	1.074	1.069	1.064	1.058	-30 (-22)	-25 (-13)	45%
1.087	1.082	1.076	1.070	1.064	-36 (-32.8)	-31 (-23.8)	50%
1.095	1.090	1.084	1.077	1.070	-42 (-44)	-37 (-35)	55%
1.103	1.098	1.092	1.084	1.076	-50 (-58)	-45 (-49)	60%

CAUTION

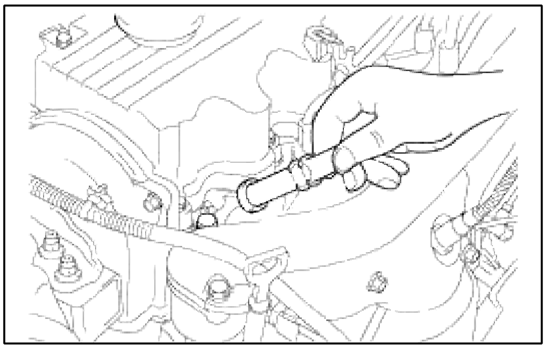
- If the concentration of the coolant is below 30%, its anti-corrosion properties will be adversely affected.
- If the concentration is above 60%, both the antifreeze and engine cooling property will decrease, affecting the engine adversely. For these reasons, be sure to maintain the concentration level within the specified range.
- Do not mix with another brand's product.

RECOMMENDED COOLANT

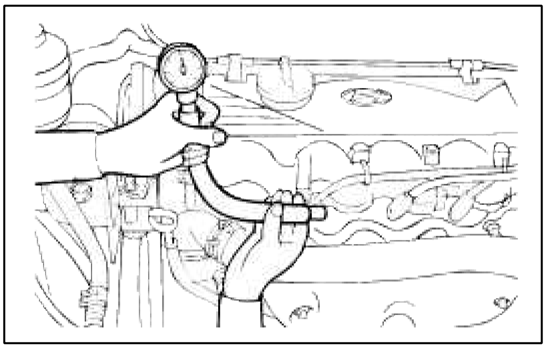
Antifreeze	Mixture ratio of anti freeze in coolant
ETHYLENE GLYCOL BASE FOR ALUMINUM	50% [Except tropical areas] 40% [Tropical areas]

CHECKING COMPRESSION PRESSURE

1. Befor checking engine compression, check the engine oil level. Also check that the starter motor and battery are all in normal operating condition.
2. Check the DTC's. Resetting the ECM will erase any stored DTC's.
3. Start the engine and wait until engine coolant temperature reaches 80~95°C (176~205°F).
4. Disconnect the fuel pump connector.
5. Turn off engine and disconnect the spark plug cables.



6. Remove the spark plug.
7. Disconnect the ignition coil connector.
8. Crank the engine to remove any foreign material in the cylinders.
9. Insert the compression gauge into the spark plug hole.



10. Depress the accelerator pedal to open the throttle fully.
11. Crank the engine and read the gauge.

Standard value : 1500 kpa (15.5 kg/cm², 220 psi)
Limit : 1200 kpa (12.5 kg/cm², 178 psi)

---

12. Repeat steps 9 to 11 on all cylinders, ensuring that the pressure differential for each of the cylinders is within the specified limit.

Limit :
Max. 150 kpa (1.5 kg/cm², 21 psi) between cylinders

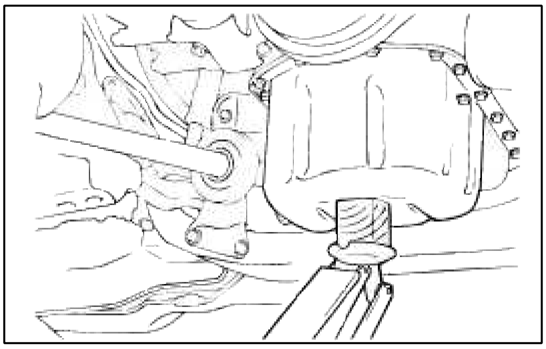
---

13. If a cylinder's compression or pressure differential is outside the specification, add a small amount of oil through the spark plug hole, and repeat steps 9 to 12.
    A. If the addition of oil makes the compression toincrease, it is likely that there may be wear between the piston ring and cylinder wall.
    B. If compression remains the same, valve seizure, poor valve seating or a compression leak from the cylinder head gasket are all possible causes.

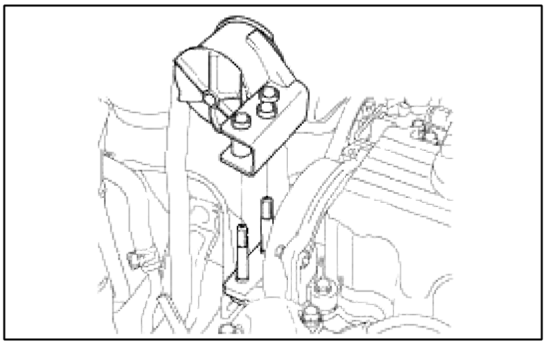
Tightening torque
Spark plug : 20~30 Nm (200~300 kg.cm, 14~22 lb.ft)

ADJUSTING TIMING BELT TENSION

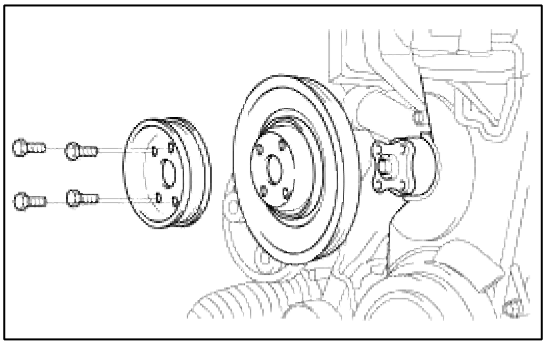
1. Turn the steering wheel fully counter clock wise.
2. Lift the vehicle by using of jack.



3. Remove the engine support bracket.

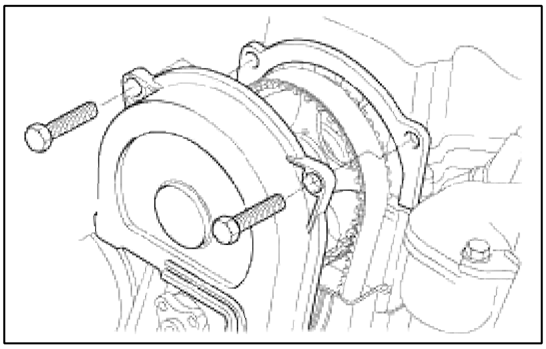


4. Loosen the coolant pump pulley mounting bolt and loosen the generator belt tension adjustment bolt.

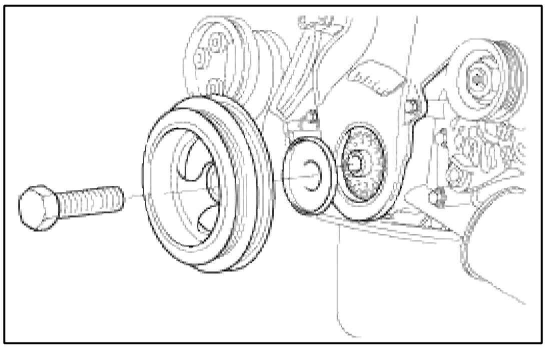


5. Remove the coolant pump pulley, generator belt, power steering pulley and power steering belt.

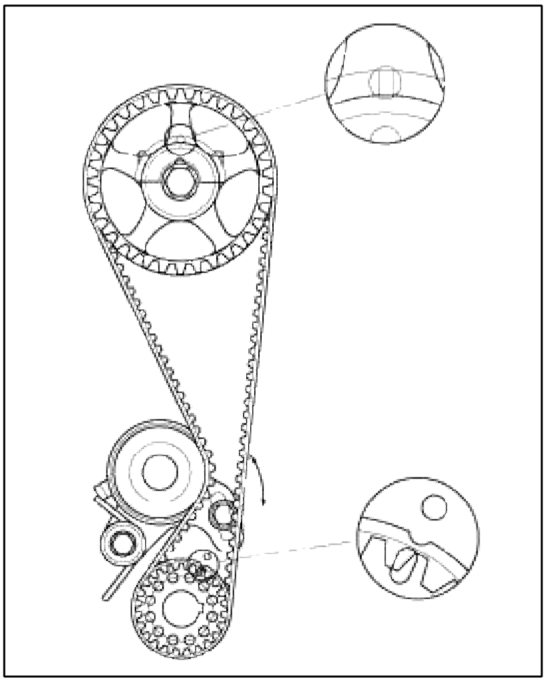
6. Remove the timing cover upper side mounting bolt.



7. Remove the crankshaft pulley.



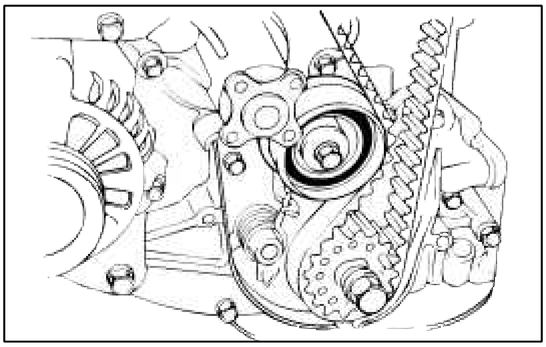
8. Turn crankshaft clockwise until enginder number 1 is at top clead center of its compression stroke.



NOTE

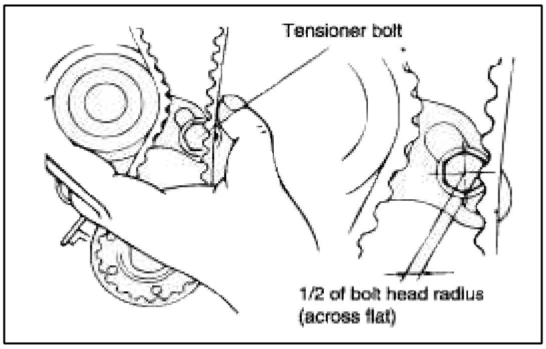
Turn the crankshaft clockwise. If turned counter clockwise, tension is not set.

9. Loosen the tensioner bolt 1 ~ 2 turns and allow tensioner spring to tension the belt.



10. Turn crankshaft clockwise as much as two camshaft sprocket teeth.
11. Tighten the tensioner bolt of slot side of first and then tighten the bolt of pivot side.
12. Check to make sure timing marks line up.
13. Check the tension of timing belt.

    When the tensioner and the tension side of the timing belt are pushed in horizontally with a moderate force [approx. 49N (11 lb)], the timing belt log end is approx. half of the tensioner mounting bolt head radius away from the bolt head center.



14. Install the timing belt cover.

Tightening torque :
10 ~ 12 Nm (100 ~ 120 kg.cm, 7.2 ~ 8.7 lb.ft)

---

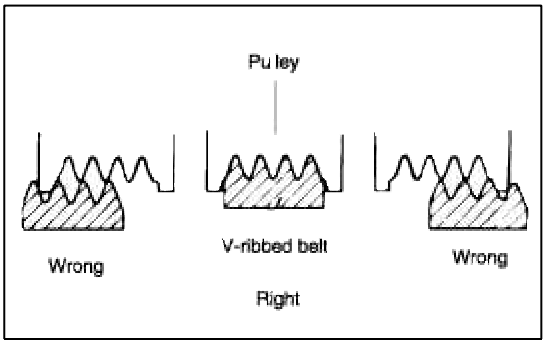
15. Install the crankshaft pulley.
16. Install the coolant pump pulley.
17. Install V-belt and adjust the belt tension.

ADJUSTING DRIVE BELT TENSION

1. Check that the belts are not damaged and are properly fit for the pulley grooves.
2. Apply 100 N (22 lbs.) force to the back and midway portion of the belt between the pulleys as shown in the illustration. Measure the amount of deflection with a tension gauge.

CAUTION

1. When installing the V-ribbed belt, check that the V-ribs are properly aligned.
2. If noise or slippage is detected, check the belt for wear, damage, or breakage on the pulley contact surface, and check the pulley for scoring. Also check the amount that the belt is deflected.



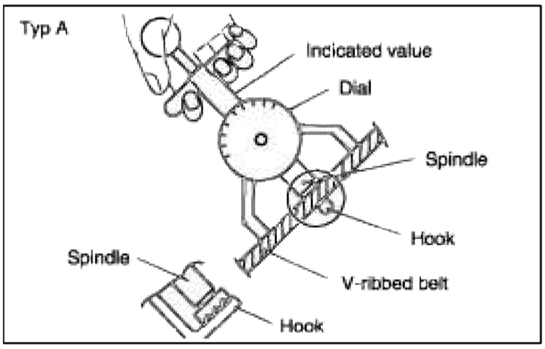
STANDARD VALUE :

Items		Adjustment	
		New	Used
For alternator	Deflection mm (in.)	7.5 ~ 9.0 (0.29 ~ 0.35)	10 (0.39)

NOTE

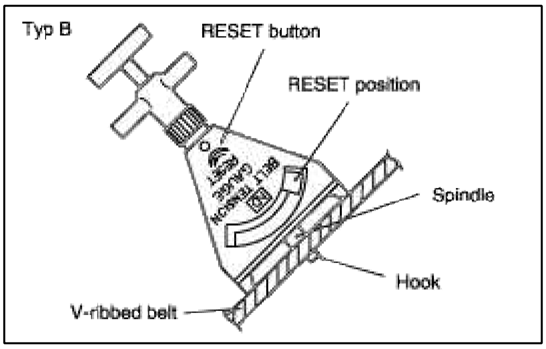
1. The belt tension must be measured half - way between the specified pulleys.
2. When a new belt is installed, adjust the tension to the central value of the standard range indicated under "New" in the above table. Let the engine idle for 5 minutes or more, and check the standard value indicated under "Inspection".
3. When adjusting a belt which has been used, or newly installed, after 5 minutes or more of operation, refer to the standard value indicated under "Used" in the above table.
4. Refer to the standard value indicated under "Inspection" for periodic inspections.

TYPE A TENSION GAUGE



TYPE B TENSION GAUGE

1. When measuring, turn the reset button in the direction of the arrow and set the gauge needle to the RESET position.
2. If the tension gauge is removed from the belt, the needle will still indicate the tension. Read the tension value after removing the gauge.



ADJUSTING THE ALTERNATOR BELT

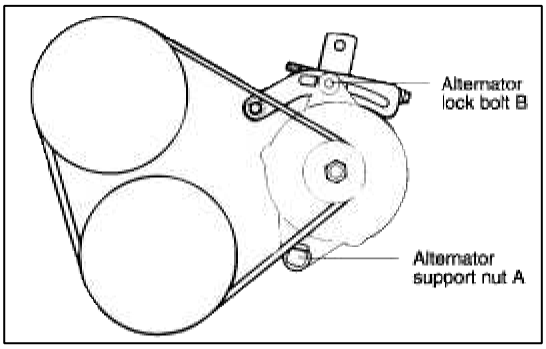
CAUTION

If the belt is too loose, it will cause noise or sudden wear.
If the belt is too tight, the engine coolant pump bearing or the alternator can get damaged.

1. Loosen the alternator nut "A" and the tension adjuster lock bolt "B"
2. Using the tension adjuster bolt, adjust the belt tension to the specification.
3. Tighten the adjuster lock bolt "B".
4. Tighten the alternator nut "A".

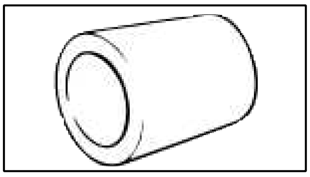
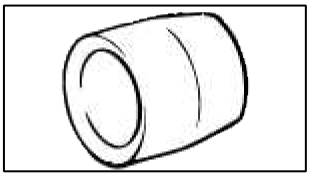
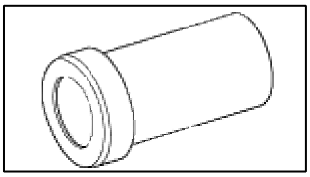
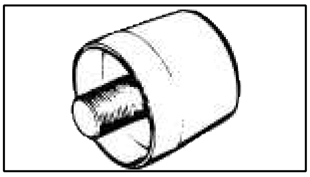
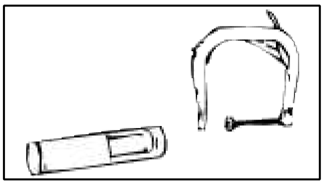
5. Check the tension or the deflection of belt, readjust if necessary.

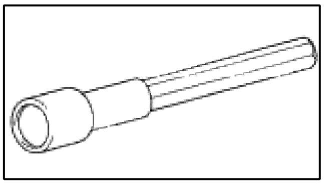
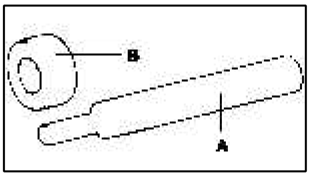
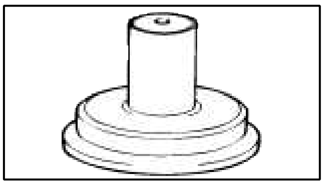
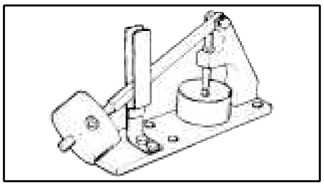
Tightening torque
Alternator support nut A :
20 ~ 25 Nm (200 ~ 250 kg.cm, 15 ~ 18 lb.ft)
Alternator lock bolt B :
15 ~ 22 Nm (150 ~ 220 kg.cm, 11 ~ 16 lb.ft)
Alternator brace mounting bolt :
20 ~ 28 Nm (200 ~ 280 kg.cm, 15 ~ 21 lb.ft)



Engine Mechanical System > General Information > Special Service Tools

SPECIAL TOOLS

Tool (Number and name)	Illustration	Use
Crankshaft front oil seal installer 09231 - 22000		Installation of the crankshaft front oil seal (use with 09231 - 22100)
Crankshaft front oil seal guide 09231 - 22100		Installation of the crankshaft front oil seal (use with 09214 - 22000)
Camshaft oil seal installer 09221 - 21000		Installation of the camshaft oil seal (use with 09221 - 21100)
Camshaft oil seal guide 09221 - 21100		Used as a guide when pressing in the camshaft oil seal (use with 09221 - 21000)
Valve spring remover and installer 09222 - 22100		Removal and installation of the inlet or exhaust valve

Valve stem oil seal installer 09222 - 22001		Installation of the valve stem oil seal
Valve guide installer 09221 - 21200 A/B		Removal and installation fo the valve guide
Crankshaft rear oil seal installer 09231 - 21000		1) Installation of the engine rear oil seal 2) Installation of the crankshaft rear oil seal
Leak down tester 09246 - 32000		Leak down test of auto lash adjuster

Engine Mechanical System > General Information > Troubleshooting

TROUBLE SHOOTING

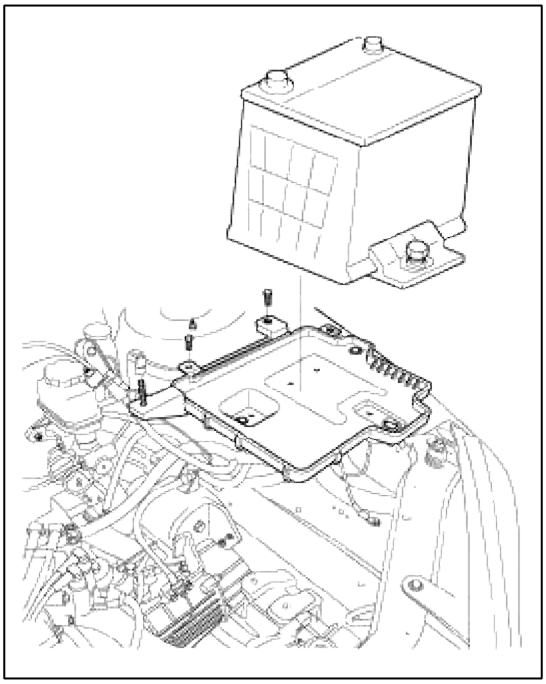
Symptom	Probable cause	Remedy
Low compression	Blown cylinder head gasket	Replace gasket
	Worn or damaged piston rings	Replace rings
	Worn piston or cylinder	Repair or replace the piston and/or cylinder block
	Worn or damaged valve seat	Repair or replace the valve and/or seat ring
Low oil pressure	Low engine oil level	Check engine oil level
	Faulty oil pressure switch	Replace
	Clogged oil filter	Replace
	Worn oil pump gears or cover	Replace
	Thin or diluted engine oil	Change and find out cause
	Oil relief valve stuck (open)	Repair
	Excessive bearing clearance	Replace
High oil pressure	Oil relief valve stuck (closed)	Repair
Excessive engine vibration	Loose engine roll stopper (front, rear)	Retighten
	Loose transaxle mount bracket	Retighten
	Loose engine mount bracket	Retighten
	Loose center member	Retighten

	Broken transaxle mount insulator	Replace
	Broken engine mount insulator	Replace
	Broken engine roll stopper insulator	Replace
Noisy valves	Thin or diluted engine oil (Low oil pressure)	Change
	Worn or damaged valve stem or valve guide	Replace
Connecting rod and main bearing noise	Insufficient oil supply	Check engine oil level
	Thin or diluted engine oil	Change and find out cause
	Excessive bearing clearance	Replace
Timing belt noise	Incorrect belt tension	Adjust belt tension
Low coolant level	Leakage of coolant	
	1. Heater or radiator hose	Repair or replace parts
	2. Faulty radiator cap	Tighten or replace clamps
	3. Thermostat housing	Replace the gasket or housing
	4. Radiator	Repair or replace
	5. Engine coolant pump	Replace parts
Clogged radiator	Foreign material in coolant	Replace coolant
Abnormally high coolant temperature	Faulty thermostat	Replace parts
	Faulty radiator cap	Replace parts
	Restricted flow in cooling system	Clear restriction or replace parts
	Loose or missing drive belt	Adjust or replace
	Faulty water pump	Replace
	Faulty temperature sensor or wiring	Repair or replace
	Faulty electric fan	Repair or replace
	Insufficient coolant	Refill coolant
Abnormally low coolant temperature	Faulty thermostat	Replace
	Faulty temperature sensor or wiring	Replace or repair
Leakage from oil cooling system	Loose connections	Replace
	Cracked or damaged ; hoses, pipes or oil cooler	Replace or repair
Inoperative electrical cooling fan	Damaged : Thermo sensor, Electrical motor, Radiator fan relay, Wiring	Replace or repair
Exhaust gas leakage	Loose connections	Retighten
	Broken pipe or muffler	Repair or replace
Abnormal noise	Detached baffle plate in muffler	Replace
	Broken rubber hanger	Replace
	Pipe or muffler contacting vehicle body	Correct
	Broken pipe or muffler	Repair or replace

ENGINE AND TRANSAXLE ASSEMBLY

REMOVAL

1. Remove the battery.



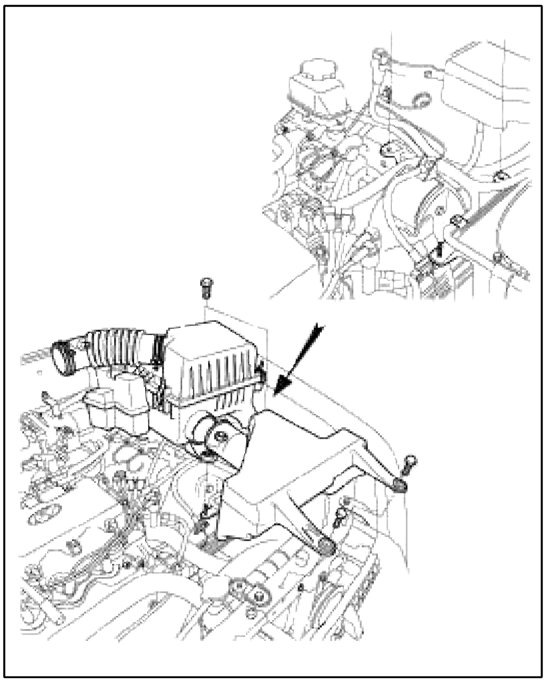
WARNING

Make sure jacks and safety stands are placed properly and hoist brackets are attached to the correct position on the engine.

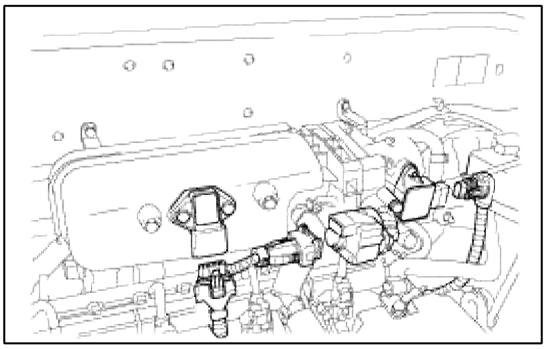
CAUTION

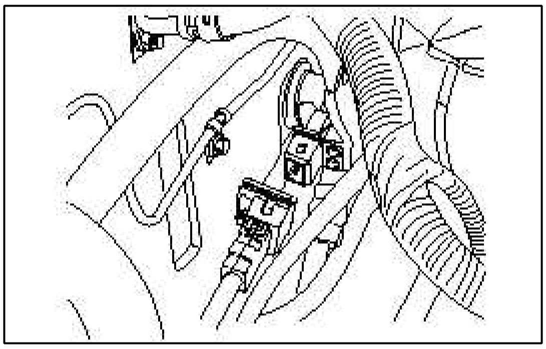
Use fender covers to avoid damaging painted surface.

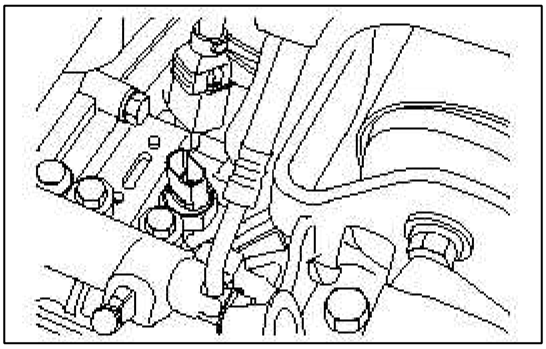
2. Detach the air cleaner.



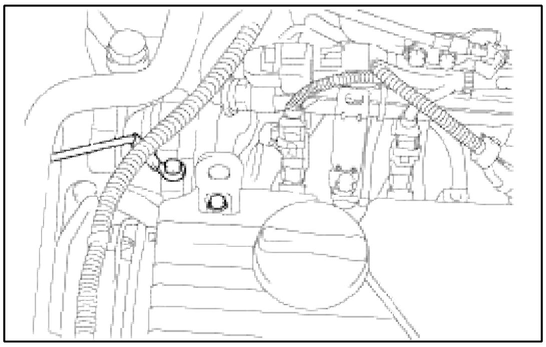
3. Disconnect the backup lamp and engine harness connectors.



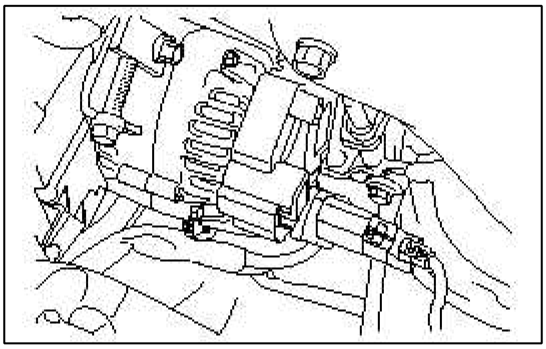


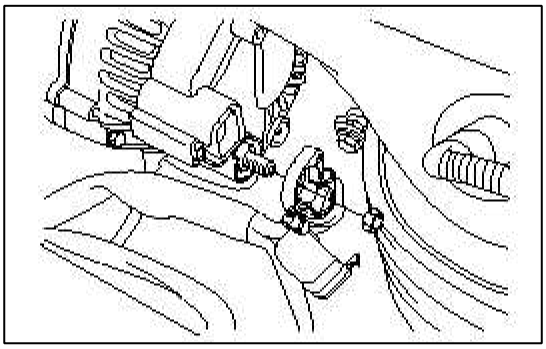


4. Disconnect the engine ground.

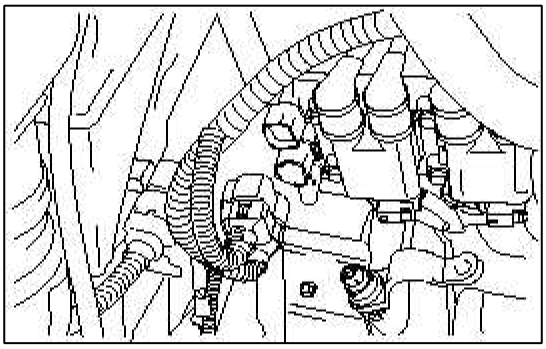


5. Disconnect the alternator connector.

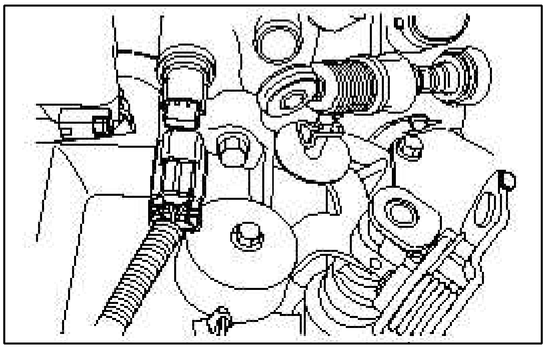


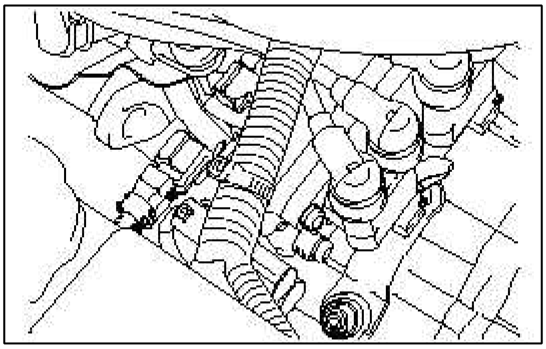


6. Disconnect the connectors for the rear Oxygen sensor harness and the ignition coil harness.

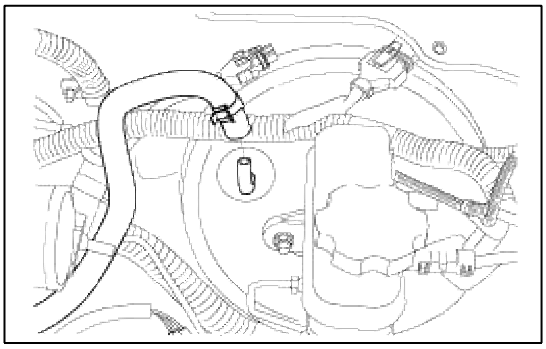


7. Disconnect the coolant temperature sensor and No.1 TDC sensor connector.

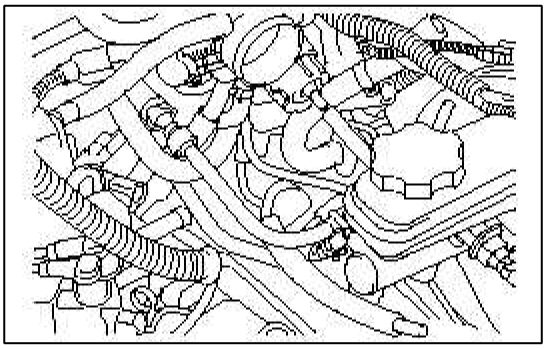


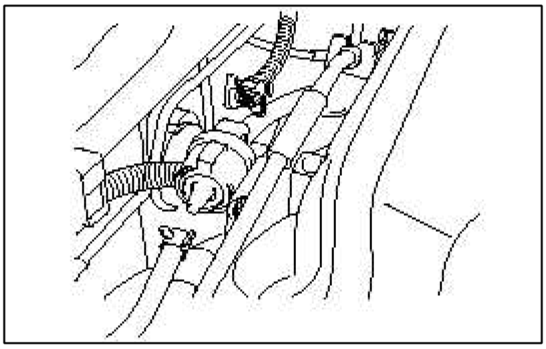


8. Disconnect the brake booster vacuum hose.



9. Remove the main fuel line and the return and vapor hoses form the engine side.

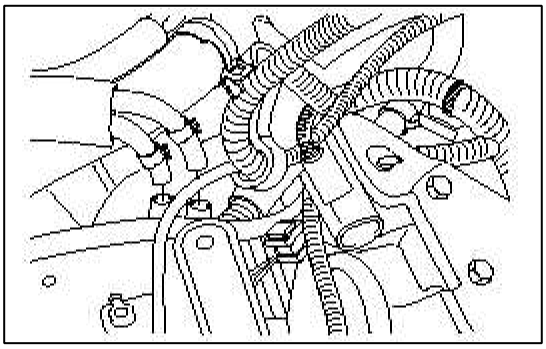




CAUTION

To reduce the residual pressure in the hoses, refer to Group Fuel System "Fuel filter replacement."

10. For vehicles with automatic transaxles, disconnect transaxle oil cooler hoses.



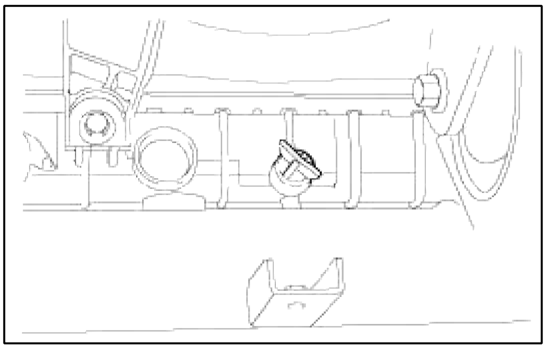
NOTE

When disconnecting the hoses, make identification marks to avoid making mistakes when reconnecting them.

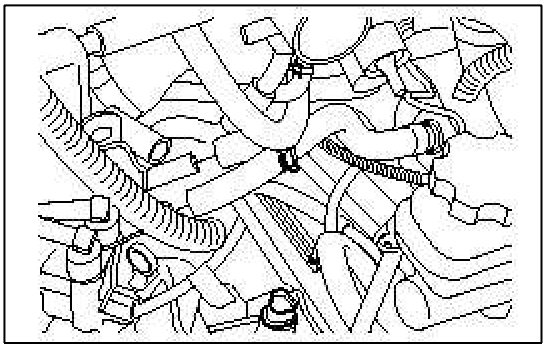
CAUTION

Be caurful not to spill oil or fluid from hoses, plug the openings to prevent foreign material from entering.

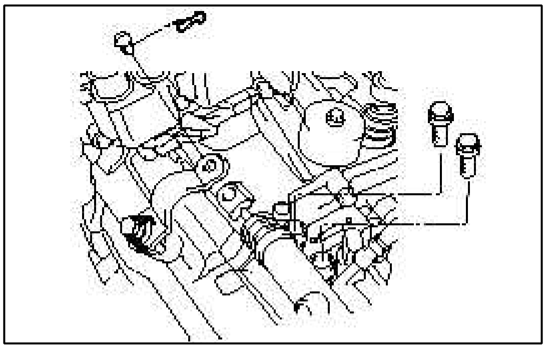
11. Drain the engine coolant from the radiator.



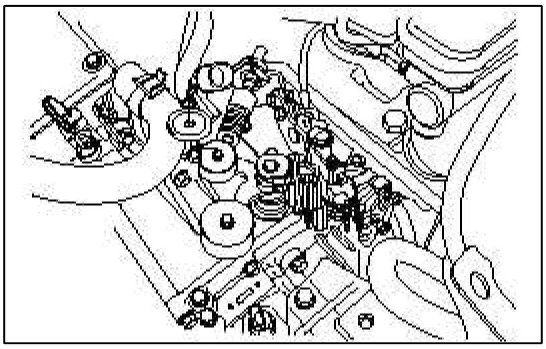
12. Disconnect the radiator upper and lower hoses on the engine side, then remove the radiator assembly.
13. Disconnect the heater hoses (inlet and outlet) on the engine side.



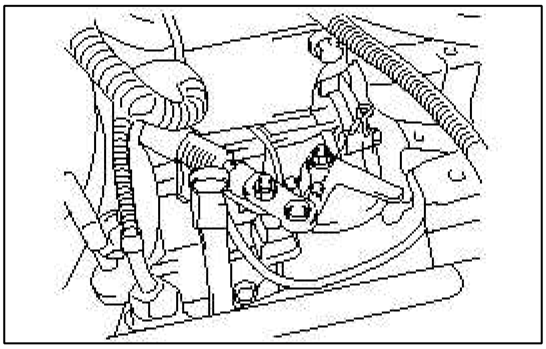
14. Disconnect the accelerator cable at the engine side.
15. For vehicles with 5-speed manual transaxles, remove the clutch release cylinder.

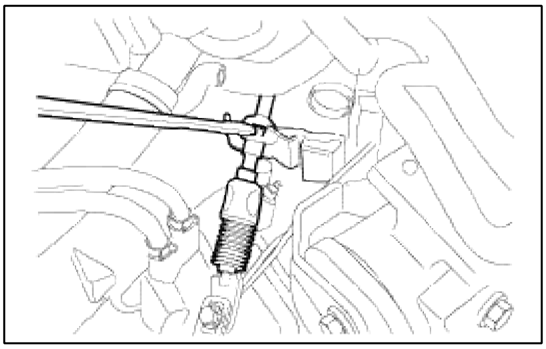


16. For vehicles with manual transaxles, remove the shift control cable from the transaxle.

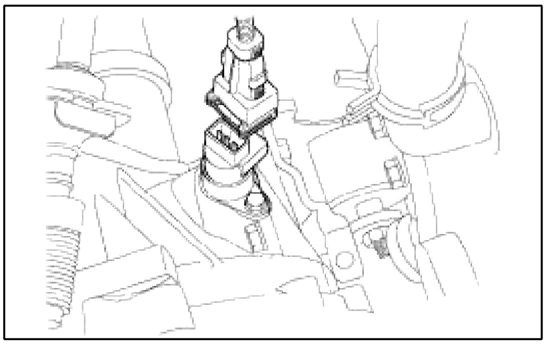


17. For vehicles with automatic transaxles, remove the control cable from the transaxle.

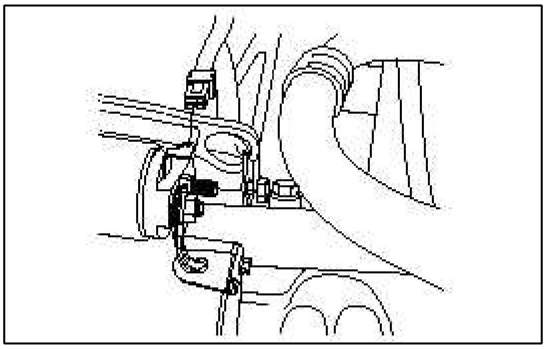


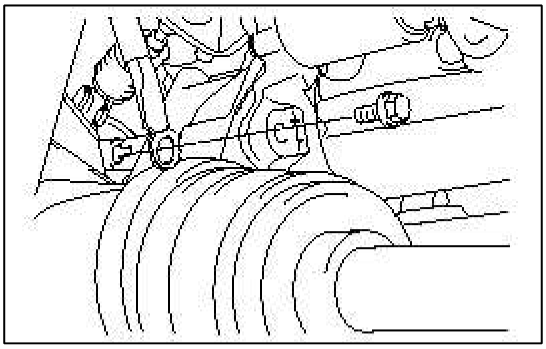


18. Disconnect the speedometer cable from the transaxle.



19. Disconnect the air conditioning compressor from the mounting bracket.
20. Disconnect the starter motor connector and ground.

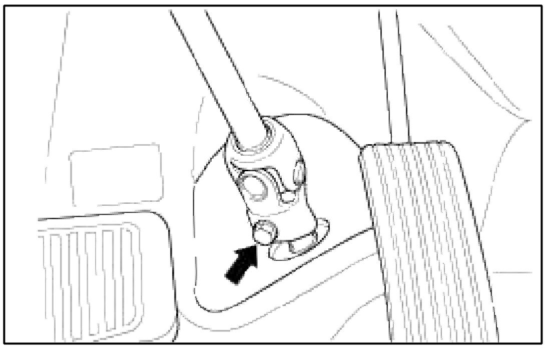




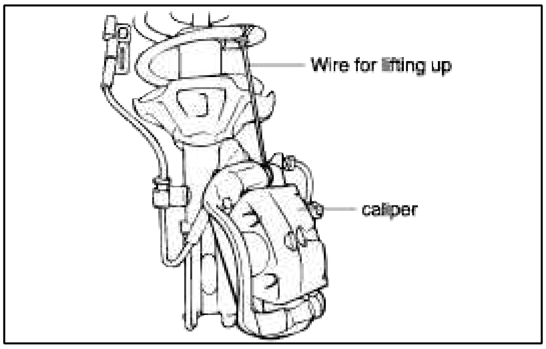
21. Remove the steering dust cover, the U-joint bolt and the gear box assembly.

NOTE

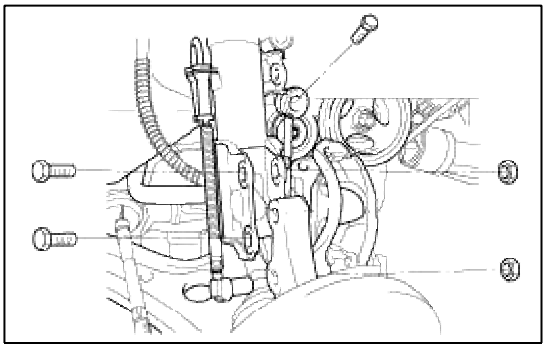
Mark between U-joint and gear box before disassembling.



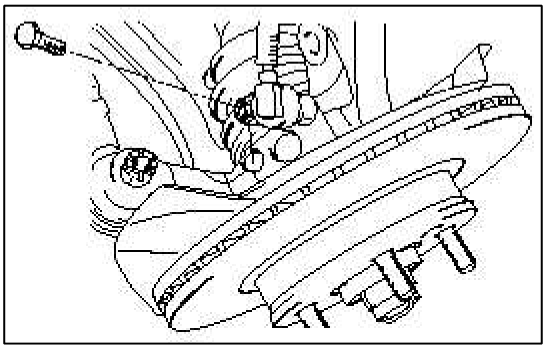
22. Jack up the vehicle and remove the front tire.
23. Remove the caliper assembly from knuckle and hold the upper side.



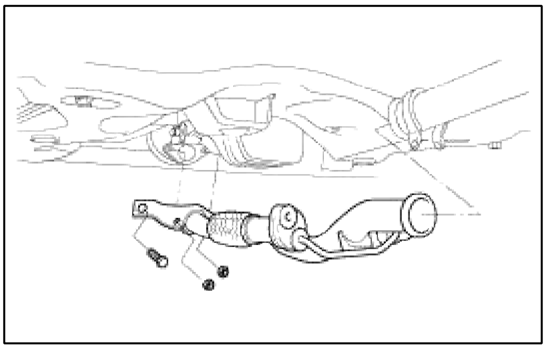
24. Loosen the strut lower bolt and separate from the knuckle.



25. Remove the wheel speed sensor from the knuckle. (with ABS)



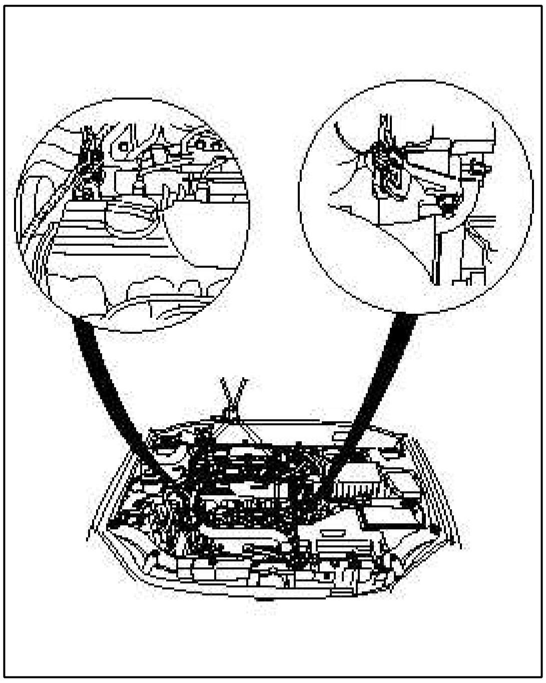
26. Disconnect the front exhaust pipe from the manifold.



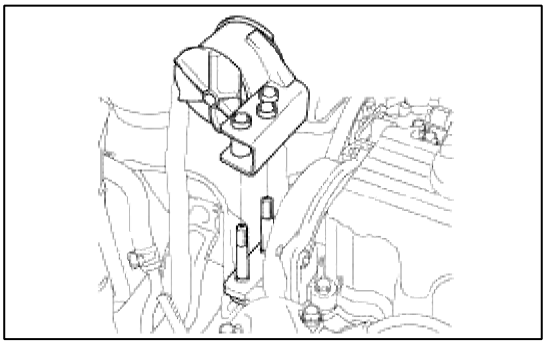
NOTE

Use wire to suspend the exhaust pipe from the bottom of the vehicle.

27. Attach chains or cables to the engine.
    Use an engine hoist or a chain hoist to slightly raise the engine (enough to support the engine's wieght while continning with the following steps.)

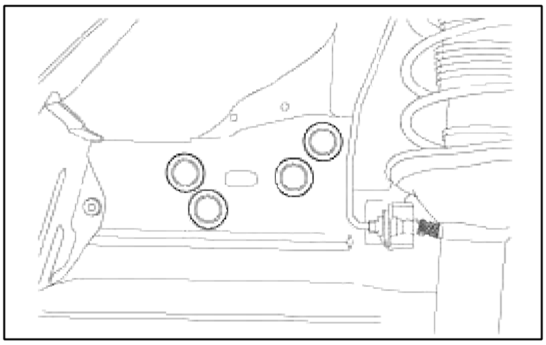


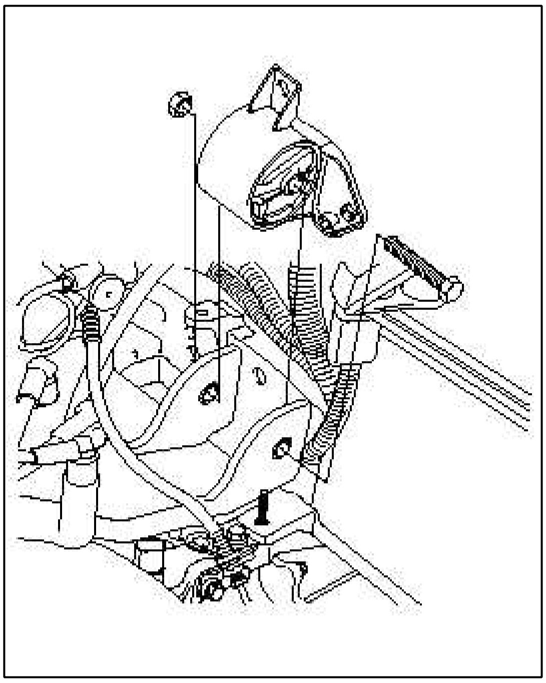
28. Remove the engine mounting bracket from the engine.



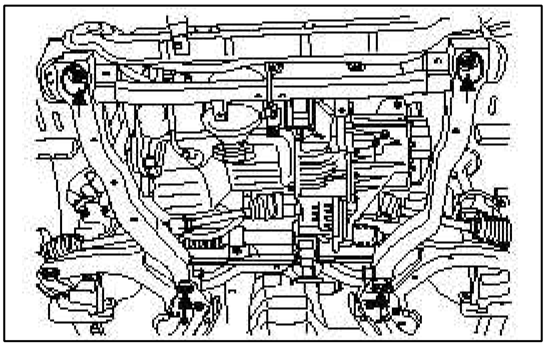
29. Slowly raise the engine (to the extent that the weight of the engine and transmission assembly is not applied to the mounting portions) and temporarily hold it in the raised position.

30. Remove the caps from the inside of the right fender shield and remove the transaxle mount bracket bolts.





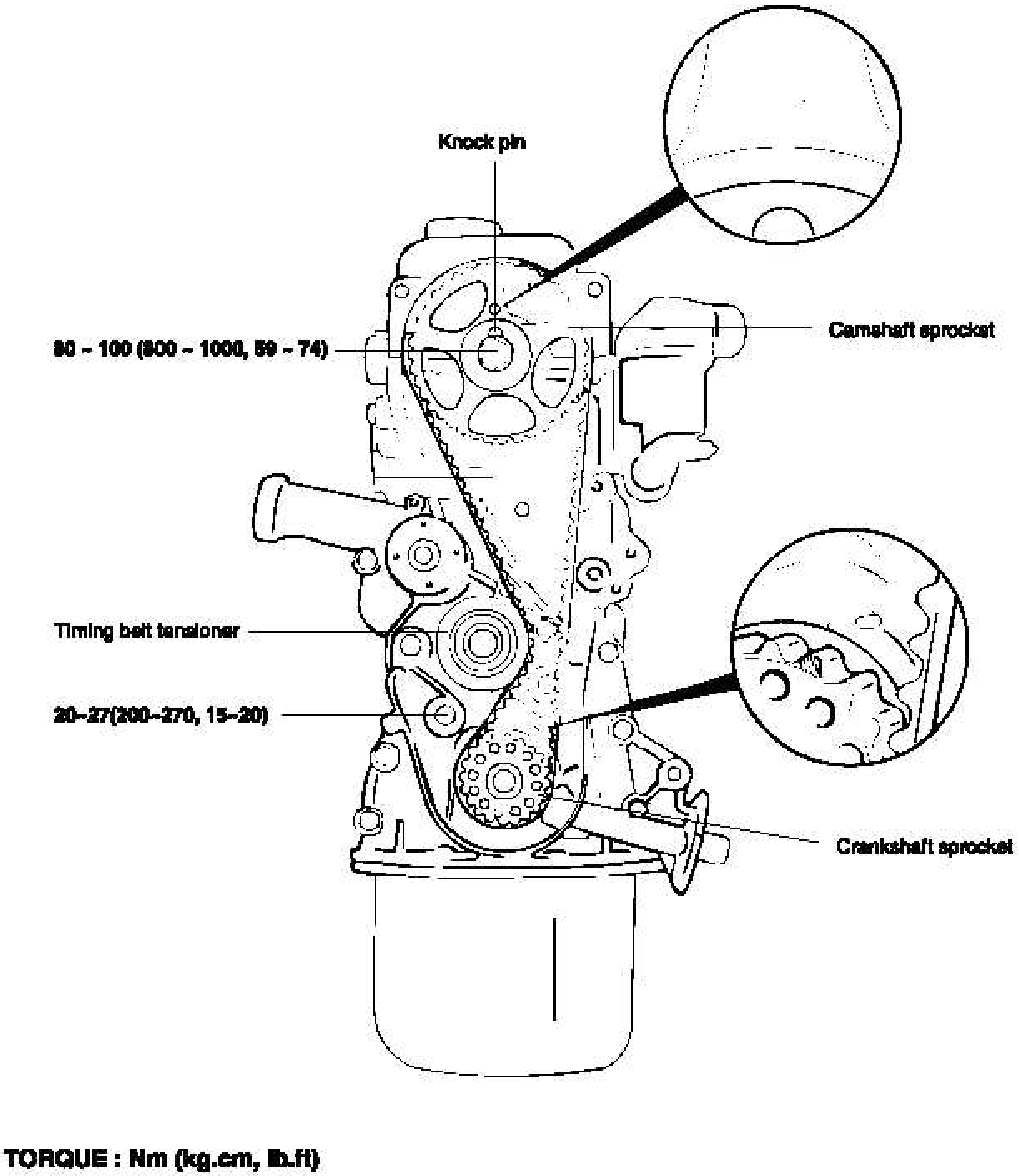
31. Remove the cross member fixing bolts and nuts.



32. While directing the transmission side downward, lift the engine and transmission assembly down and out of the vehicles.

Engine Mechanical System > Timing System > Timing Belt > Components and Components Location

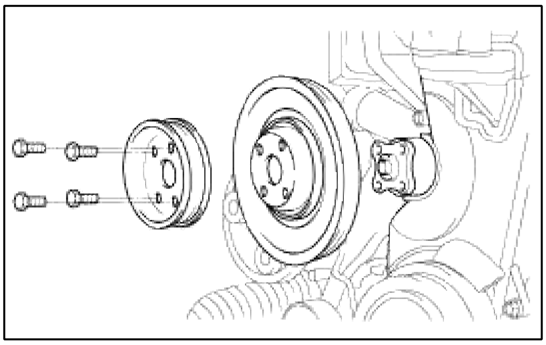
COMPONENTS


Knock pin
80 ~ 100 (800 ~ 1000, 59 ~ 74)
Camshaft sprocket
Timing belt tensioner
20~27(200~270, 15~20)
Crankshaft sprocket
TORQUE : Nm (kg.cm, lb.ft)

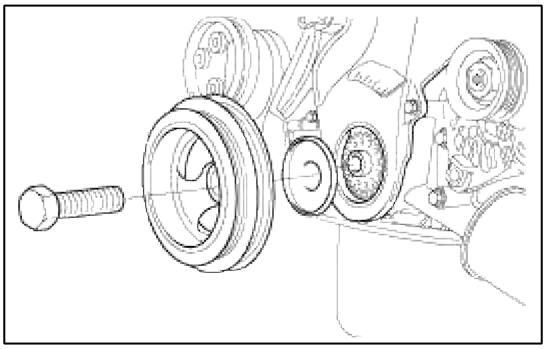
Engine Mechanical System > Timing System > Timing Belt > Repair procedures

DISAESSEMBLY

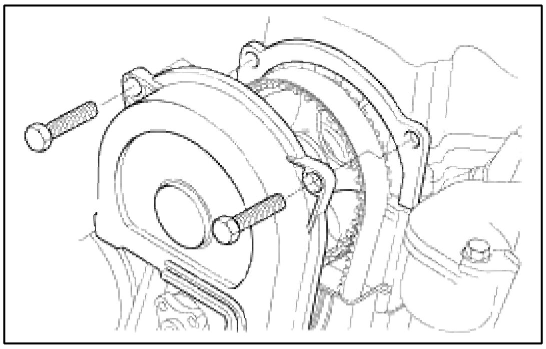
1. Loosen the coolant pump pulley bolts.



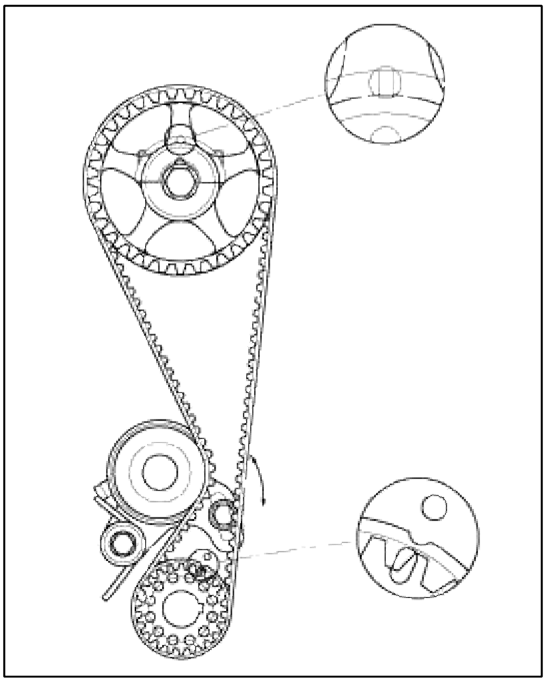
2. Loosen the alternator bolt.
3. Remove the coolant pump pulley and belt.
4. Remove the crankshaft pulley.



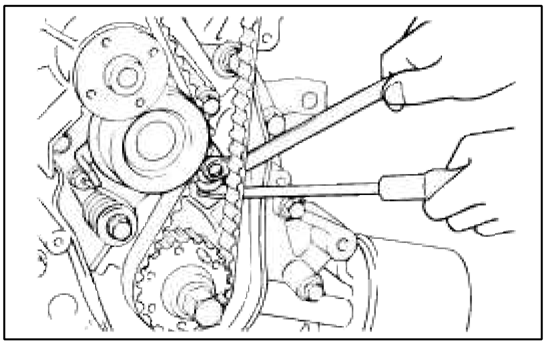
5. Remove the timing belt cover.



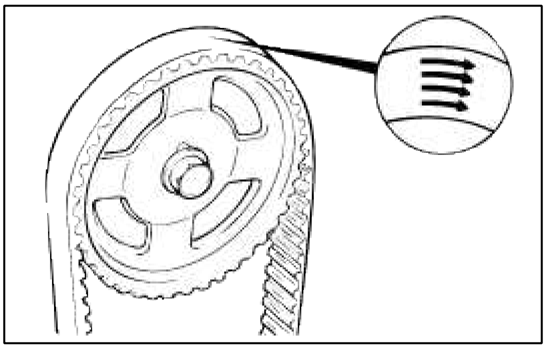
6. Align the timing marks of the camshaft sprocket and crankshaft sprocket, with the No.1 piston placed at top dead center on its compression stroke.



7. Move the timing belt tensioner pulley toward the coolant pump and temporarily secure it.



8. Remove the timing belt.

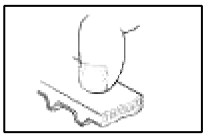
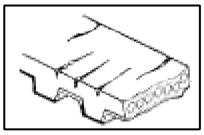
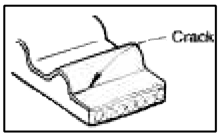
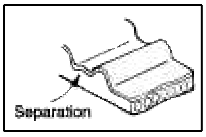


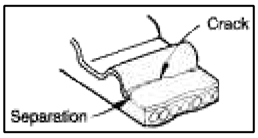
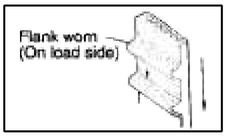
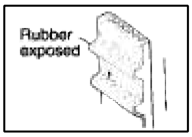
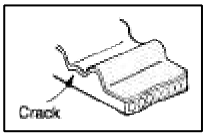
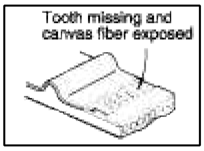
9. Remove the camshaft sprocket.
10. Remove the crankshaft sprocket bolts. Remove the crankshaft sprocket and flange.
11. Remove the timing belt tensioner.

INSPECTION

TIMING BELT

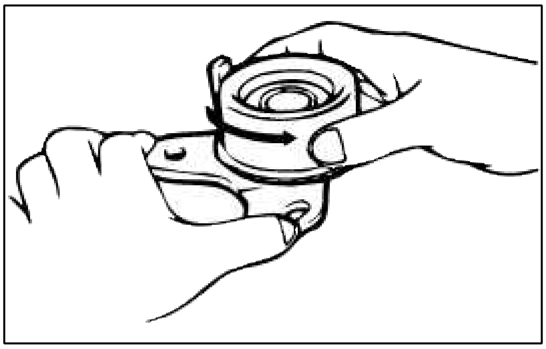
1. Check the belt for oil or dust deposits. Replace, if necessary. Small deposits should be wiped away with a dry cloth or paper. Do not clean with solvent.
2. When the engine is overhauled or belt tension adjusted, carefully check the belt. If any of the following flaws are evident, replace the belt.

Description	Flaw conditions
1. Hardened back surface Back surface glossy. Non-elastic and so hard that when your fingernail is pressed into it, no mark is produced.	
2. Cracked back surface rubber	
3. Cracked or separating canvas	
	

	 Crack Separation
4. Badly worn teeth (initial stage) Canvas on load side tooth flank worn (Fluffy canvas fibers, rubber gone and color changed to white, and unclear canvas texture)	 Flank worn (On load side)
5. Badly worn teeth (last stage) Canvas on load side tooth flank worn down and rubber exposed (tooth width reduced)	 Rubber exposed
6. Cracked tooth bottom	
7. Missing tooth	 Tooth missing and canvas fiber exposed
8. Side of belt badly worn NOTE A normal belt should have precisely cut sides as if cut by a sharp knife.	
9. Side of belt cracked	

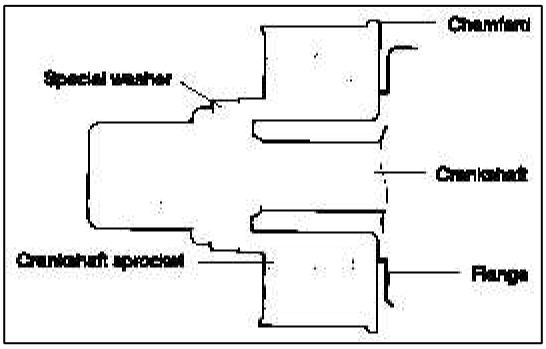
SPROCKETS AND TENSIONER

1. Check the camshaft sprocket, crankshaft sprocket, tensioner pulley, and idler pulley for abnormal wear, cracks, or damage. Replace as necessary.
2. Inspect the tensioner pulley and the idler pulley for easy and smooth pulley rotation, play or noise. Replace as necessary.



REASSEMBLY

1. Install the flange and crankshaft sprocket as shown.
   Pay close attention to their mounting directions.



Tightening torque
Crankshaft sprocket bolt :
140 ~150Nm (1400 ~ 1500kg.cm, 103 ~ 111lb.ft)

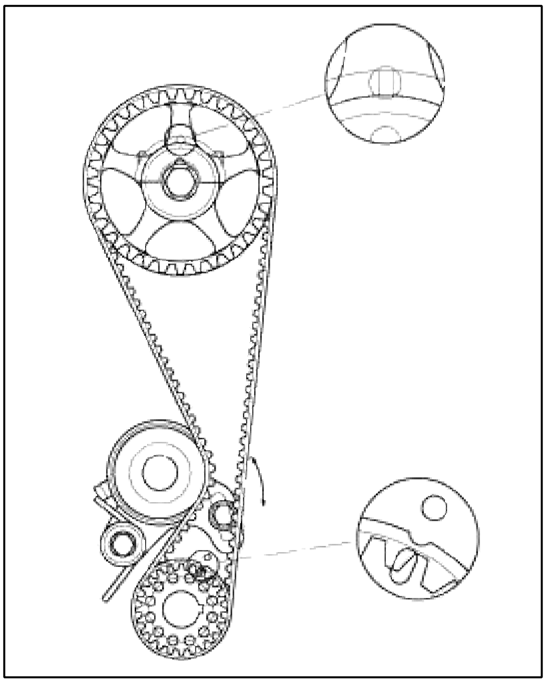
---

2. Install the camshaft sprocket and tighten the bolt to the specified torque.

Tightening torque
Camshaft sprocket bolt :
80 ~ 100 Nm (800 ~ 1000 kg.cm, 59 ~ 74 lb.ft)

---

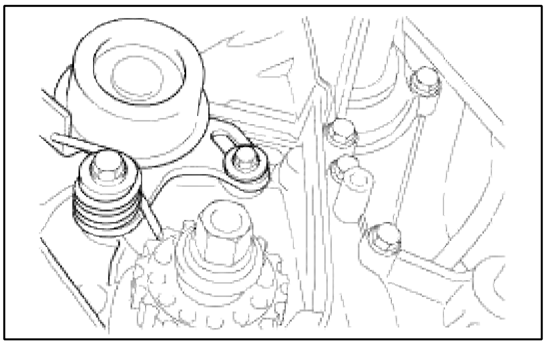
3. Align the timing marks of the camshaft sprocket and crank shaft sprocket, with the No.1 piston placed at top dead center on its compression stroke.



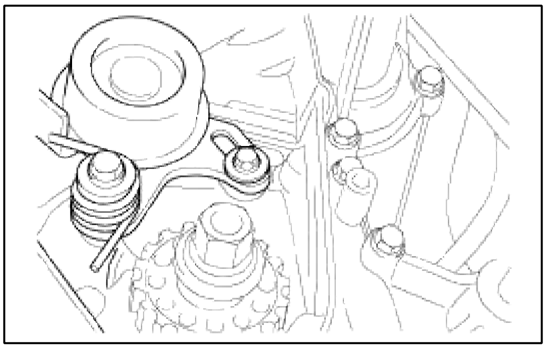
NOTE

When installing camshaft sprocket.
Make sure that cmashaft sprocket knock pin fits small hole in pulley as shown.

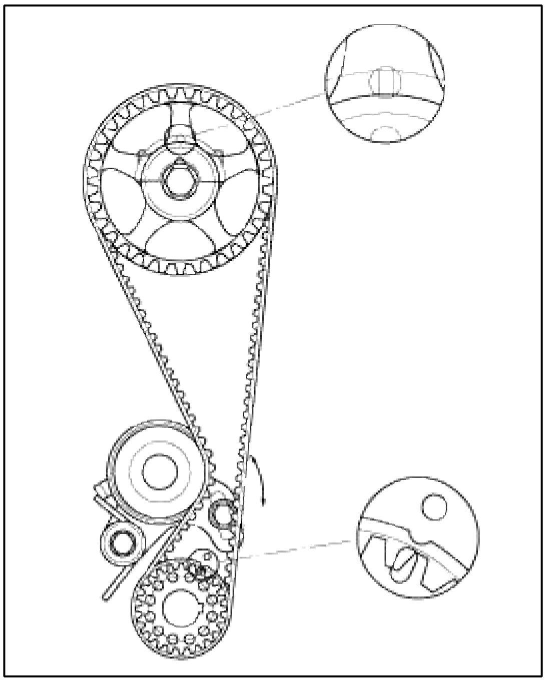
4. Tentatively fasten the timing belt tensioner where its pulley is nearest the water pump body.



5. Hang the tensioner spring on the tensioner bracket and insert the other side into the front case using a screw driver.



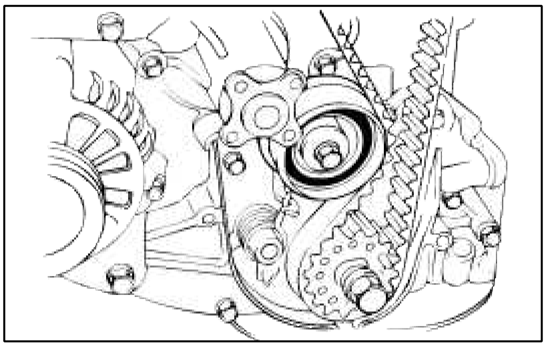
6. Install the timing belt tightly in the sequence shown.
   ①Crankshaft sprocket → ②Camshaft sprocket → ③Timing belt tensioner.



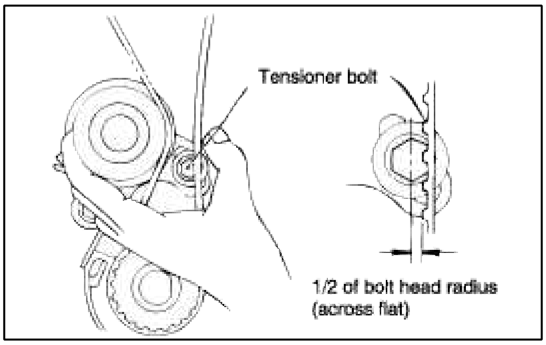
7. Install timing belt so as not to give salck to tension side.

> **NOTE**
>
> Then make sure that timing marks are at correct position respectively with tension side in strained state by applying force to camshaft sprocket in reversing direction.

8. Loosen the tensioner mounting bolt in the order as shown to give the timing belt spring tension.



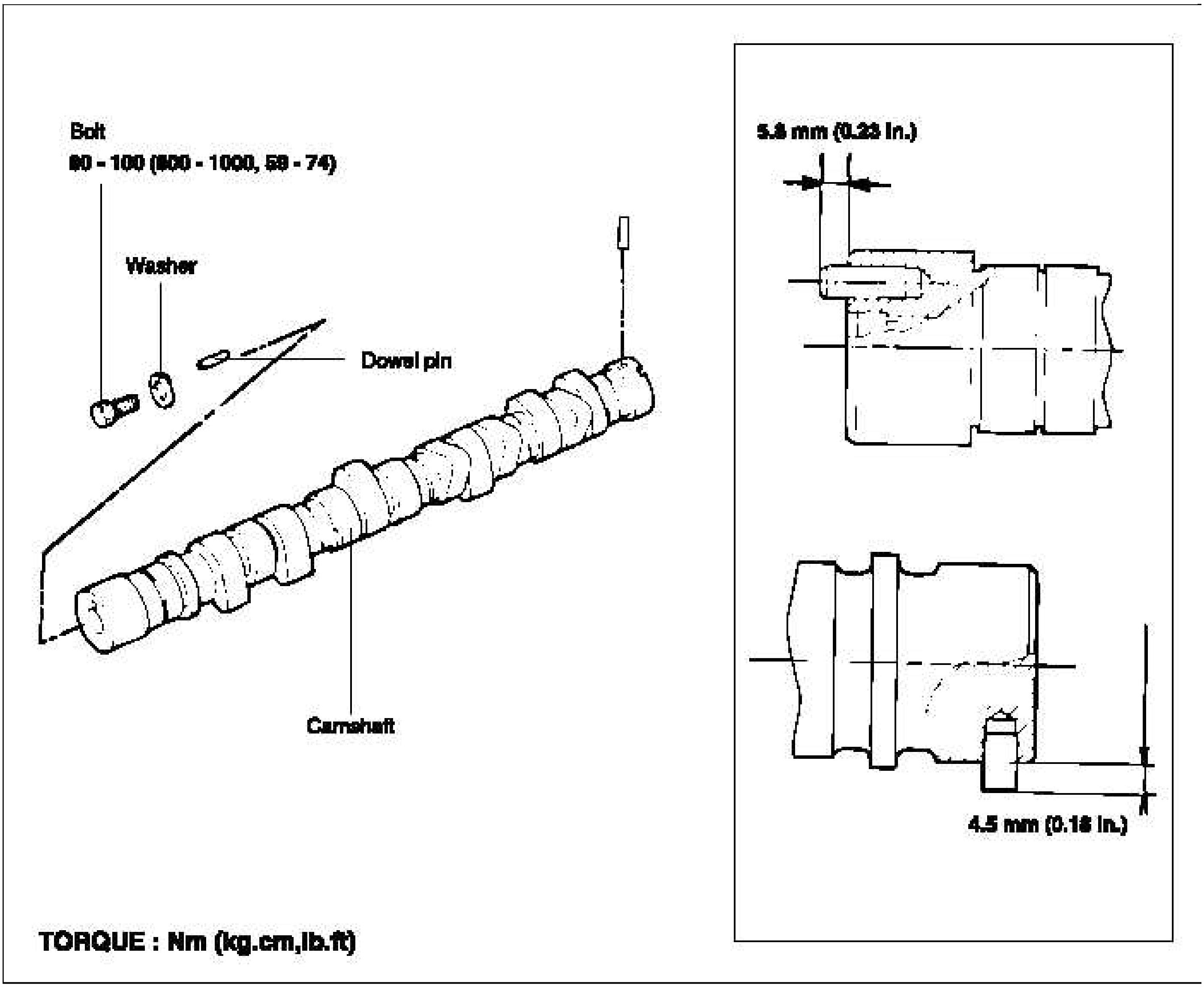
9. Rotate crankshaft in regular direction (clockwise view from front) through angle equivalent to two teeth (15°) of camshaft sprocket.
10. Add force to tensioner in direction of regular rotation (→ direction) to bring belt teeth in perfect contact with sprocket teeth without a gap.
11. After making sure of this state.
    Fix tensioner so that only the tensioner spring is movable.
12. Rotate the crankshaft pulley two or four turns conter clockwise so that the timing belt positions itselt on the sprockets.
13. Recheck the belt tension. Verify that when the tensioner and the tension side of the timing belt are pushed in horizontally with a moderate force [approx. 49N (11 lb)], the timing belt is half of the tensioner mounting bolt head radius away from the bolt head center.



14. Install the timing belt cover.
15. Install the crankshaft pulley.
16. Install the A/C compressor belt and adjust the belt tension.
17. Install the coolant pump pulley.
18. Install the V-belt and adjust the belt tension.

Engine Mechanical System > Cylinder Head Assembly > Camshaft > Components and Components Location

COMPONENTS

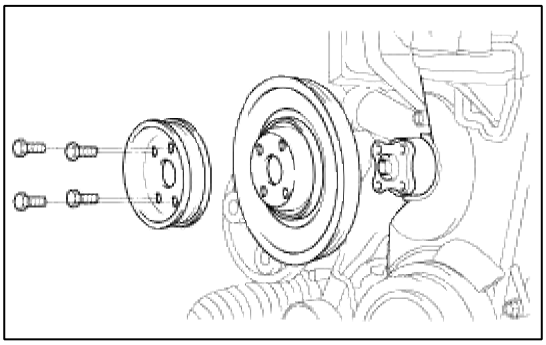

Bolt
80 - 100 (800 - 1000, 58 - 74)
Washer
Dowel pin
Camshaft
5.8 mm (0.23 in.)
4.5 mm (0.18 in.)
TORQUE : Nm (kg.cm,lb.ft)

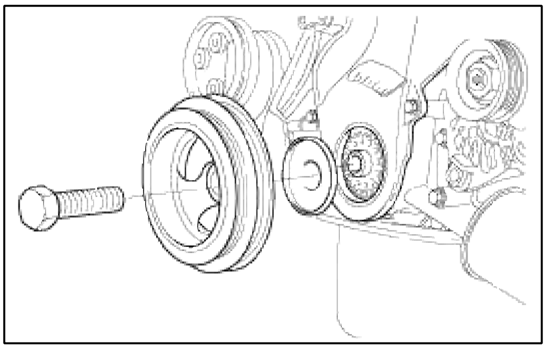
Engine Mechanical System > Cylinder Head Assembly > Camshaft > Repair procedures

DISASSEMBLY

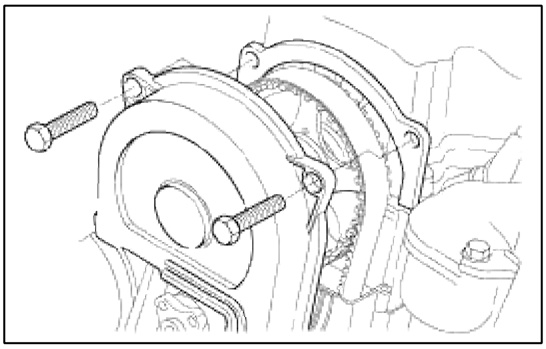
1. Disconnect the breather hose and the PCV hose.

2. Remove the coolant pump pulley and crankshaft pulley.

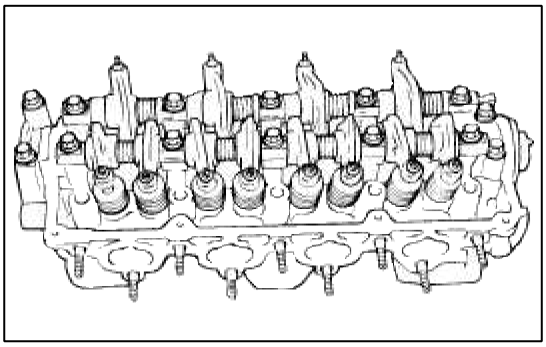




3. Remove the timing belt cover.

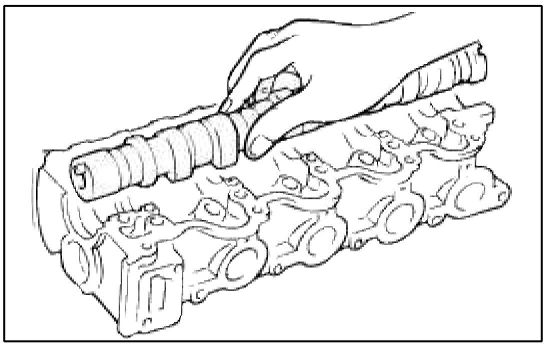


4. Move the timing belt tensioner pulley toward the coolant pump and temporarily secure it.
5. Remove the timing belt from the camshaft sprocket.
6. Remove the camshaft sprocket.
7. Remove the rocker cover.
8. Remove the rocker arm shaft assembly, Refer to "Rocker Arms and Rocker Arm Shafts" section.



9. Remove the camshaft bearing caps.

10. Remove the camshaft.

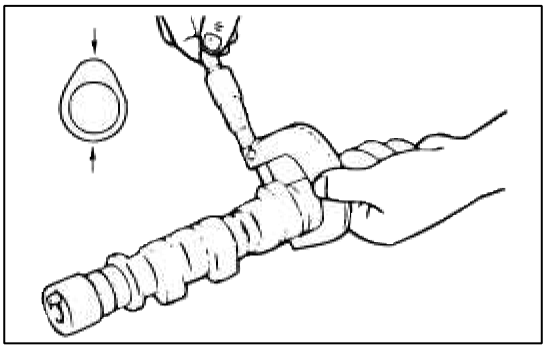


INSPECTION

CAMSHAFT

1. Check the camshaft journals for wear. If the journals are badly worn, replace the camshaft.
2. Check the cam lobes for damage. If the lobe is damaged or worn excessively, replace the camshaft.

Cam height
Standard value
Intake : 42.8575 mm (1.6873 in.)
Exhaust : 42.7354 mm (1.6825 in.)
Limit
Intake : 42.3575 mm (1.6676 in.)
Exhaust : 42.2353 mm (1.6628 in.)



3. Check the cam surface for abnormal wear or damage, and replace if necessary.
4. Check each bearing for damage. If the bearing surface is excessively damaged, Replace the cylinder head assembly or camshaft bearing cap, as necessary.

OIL SEAL (CAMSHAFT FRONT)

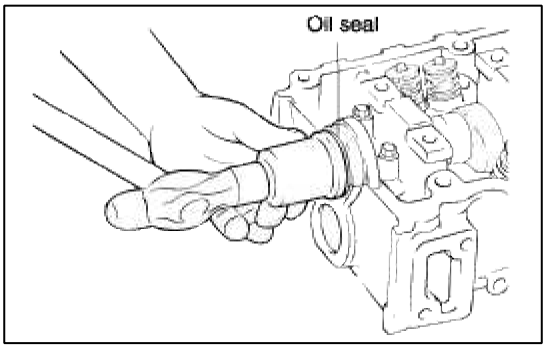
1. Check the lips for wear. If lip threads are worn, replace.
2. Check the oil seal lip contacting surface of the camshaft. If it is worn in stages, replace the camshaft.

Camshaft end play :
0.07 ~ 0.28 mm (0.0003 ~ 0.0011 in.)

REASSEMBLY

1. Install the camshaft after lubricating the journal of the camshaft with engine oil.
2. Install the camshaft bearing caps.
3. Install the rocker arm and rocker arm shaft.
   Refer to the "Rocker Arms and Rocker Arm Shafts" section.

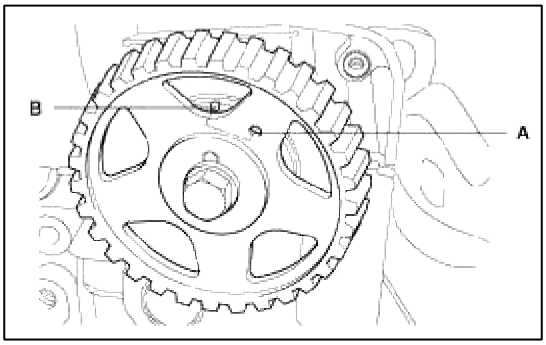
4. Using the Special Tools, Camshaft Oil Seal Installer (09221-21000), press and fit the camshaft oil seal. Be sure to apply engine oil to the external surface of the ouil seal.
   Insert the oil seal along the camshaft front end and install by driving the installer with a hammer until the oil seal is fully seated.

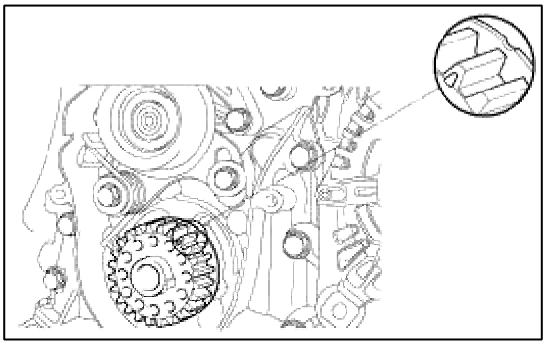


5. Install the camshaft sprocket and tighten the bolts to the specified torque.

Tightening torque
Camshaft sprocket bolt :
80 ~ 100 Nm (800 ~ 1000 kg.cm, 59 ~ 74 lb.ft)

6. Align the camshaft sprocket and crankshaft sprocket timing marks. The piston in the No. 1 cylinder will then be at top dead center on the compression stroke.





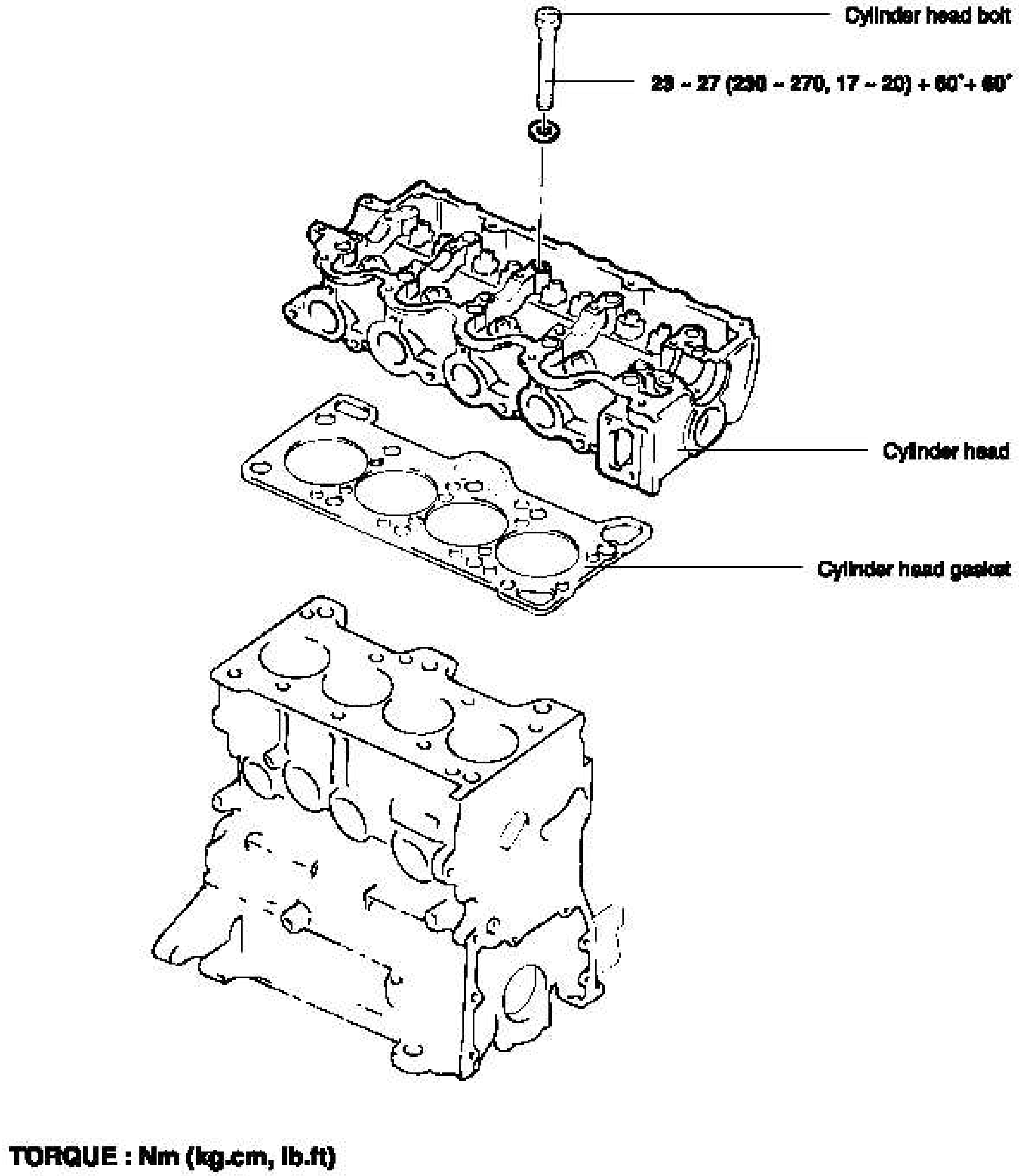
7. Intall a gasket in the rocker cover groove.
8. Temporarily install the rocker cover.
9. Start the engine and run at idle.
10. Install the rocker cover and tighten the bolts to the specified torque.

Tightening torque
Rocker cover bolt : 8~10Nm (80~100 kg.cm, 6~7 lb.ft)

11. Install the timing belt cover.
12. Install the coolant pump pulley and crankshaft pulley.

Engine Mechanical System > Cylinder Head Assembly > Valve > Components and Components Location

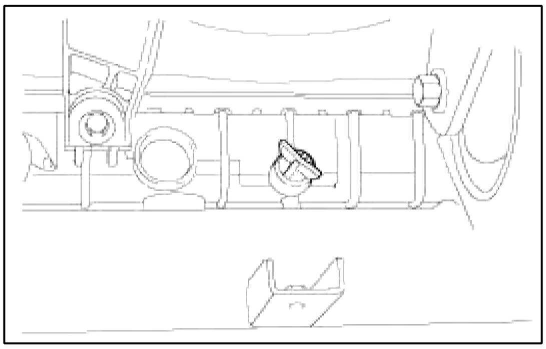
COMPONENTS


Cylinder head bolt
23 ~ 27 (230 ~ 270, 17 ~ 20) + 60°+ 60°
Cylinder head
Cylinder head gasket
TORQUE : Nm (kg.cm, lb.ft)

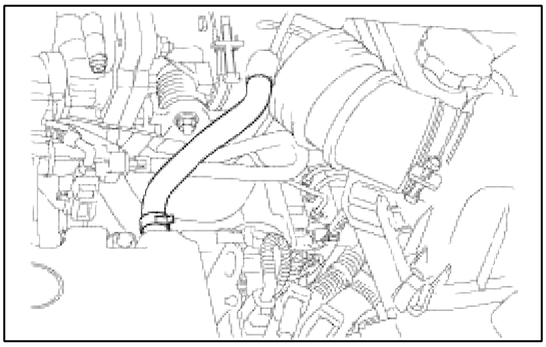
Engine Mechanical System > Cylinder Head Assembly > Valve > Repair procedures

DISASSEMBLY

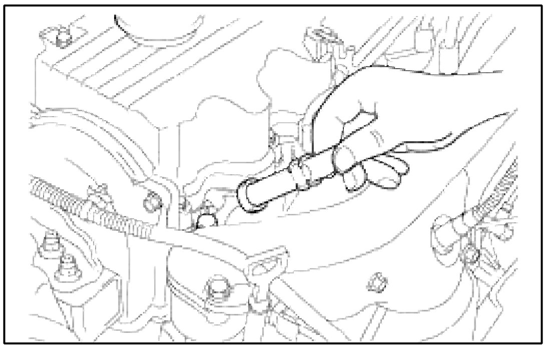
1. Drain the coolant and disconnect the upper radiator hose.



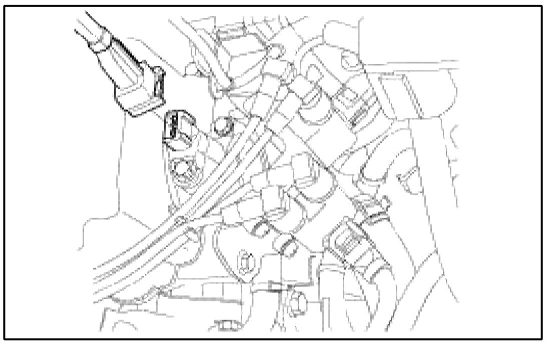
2. Remove the breather hose. (between the air cleaner and the rocker cover)



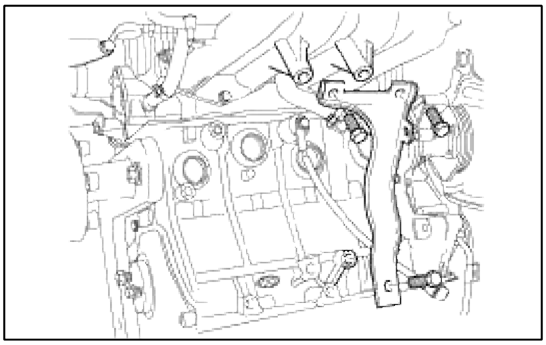
3. Remove the air intake hose.
4. Remove the vacuum hose, fuel hose and coolant hose.
5. Remove the cables from the spark plugs. The cables should be removed by holding the boot portion.



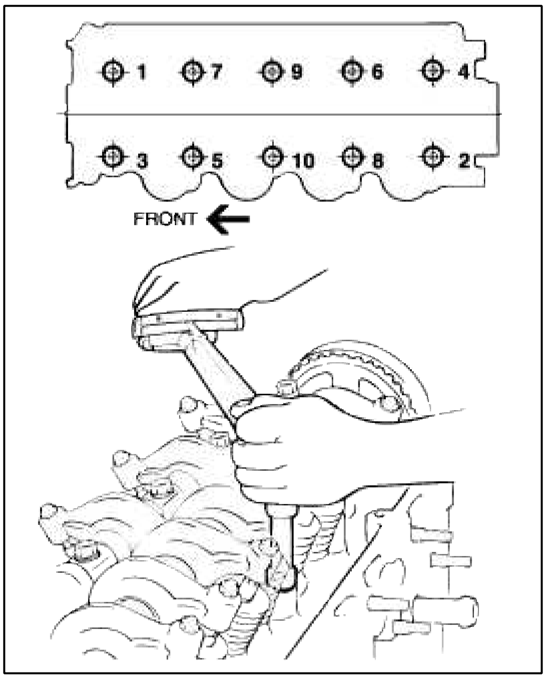
6. Remove the ignition coil.



7. Remove the surge tank bracket.



8. Remove the intake manifold.
9. Remove the heat protector and exhaust manifold assembly.
10. Remove the coolant pump pulley and the crankshaft pulley.
11. Remove the timing belt cover.
12. Move the timing belt tensioner pulley toward the coolant pump and temporarily secure it.
13. Remove the timing belt.
14. Remove the rocker cover.
15. Remove the cylinder head assembly. The cylinder head bolts should be removed using Cylinder Head Bolt Wrench, in the sequence as shown in the illustration.



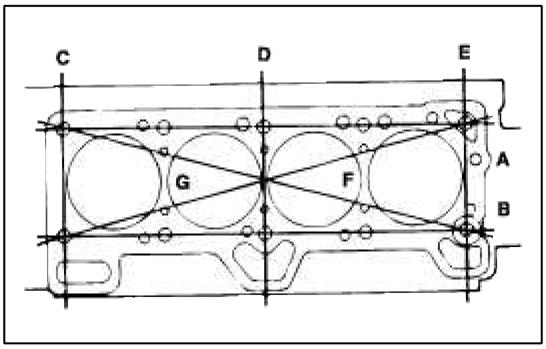
16. Remove the gasket pieces from the cylinder block top surface and cylinder head bottom surface.

> **NOTE**
>
> Make sure that the gasket pieces do not fall in to the engine.

INSPECTION

1. Check the cylinder head for cracks, damage and coolant leakage.
2. Remove scale, sealing compound and carbon deposits completely. After cleaning oil passages, apply compressed air to make certain that the passages are not clogged.

3. Check the cylinder head surface for flatness using a straight edge in the direction of A, B, ...as shown.



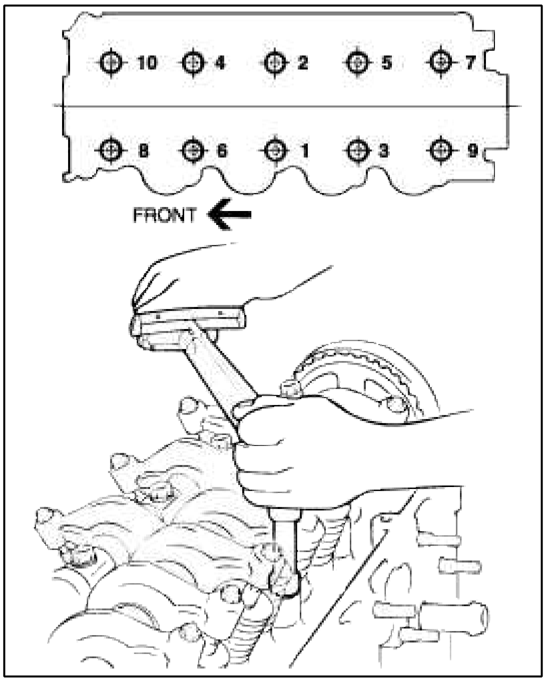
If flatness exceeds service limit in any direction, replace the cylinder head, or lightly machine the cylinder head surface.

Cylinder head flatness
Standard value : Less than 0.03 mm (0.012 in.)
Limit : 0.08 mm (0.0031 in.)

REASSEMBLY

1. Clean all gasket surfaces of the cylinder block and the cylinder head.
2. Install a new cylinder head gasket onto the cylinder head assembly. Do not apply sealant to the gasket and do not reuse the old cylinder head gasket.
3. Install the cylinder head bolts. Starting at top center. Tighten all cylinder head bolts in sequence as shown in illustration, using the Cylinder Head Bolt Wrench. Repeat the procedure, retightening all cylinder head bolt to the specified torque.

Tightening torque
23~27Nm (230~270kg.cm, 17~20lb.ft)+60°+45°



4. Move the timing belt tensioner pulley toward the coolant pump and temporarily secure it.
5. Install the timing belt on the camshaft sprocket, making sure that the tension side is tightened by turning the camshaft sprocket in reverse. Make sure all timing marks are in alignment.
6. Adjust the timing according to the "Timing Belt" section.

7. Install the rocker cover and tighten the bolts to the specified torque.

Tightening torque
Rocker cover bolt :
8 ~ 10 Nm (80 ~ 100 kg.cm, 6 ~ 7 lb.ft)

---

8. Install the timing belt cover.
9. Install the new intake manifold gasket and the intake manifold. Tighten the nuts and bolts to the specified torque.

Tightening torque
Manifold nuts and bolts (both intake and exhaust) :
15 ~ 20 Nm (150 ~ 200 kg.cm, 11 ~ 15 lb.ft)

---

10. Install the new exhaust manifold gasket and the exhaust manifold. Tighten the exhaust manifold attaching nuts to the specified torque.
11. Install the surge tank and tighten the nuts and bolts to the specified torque.

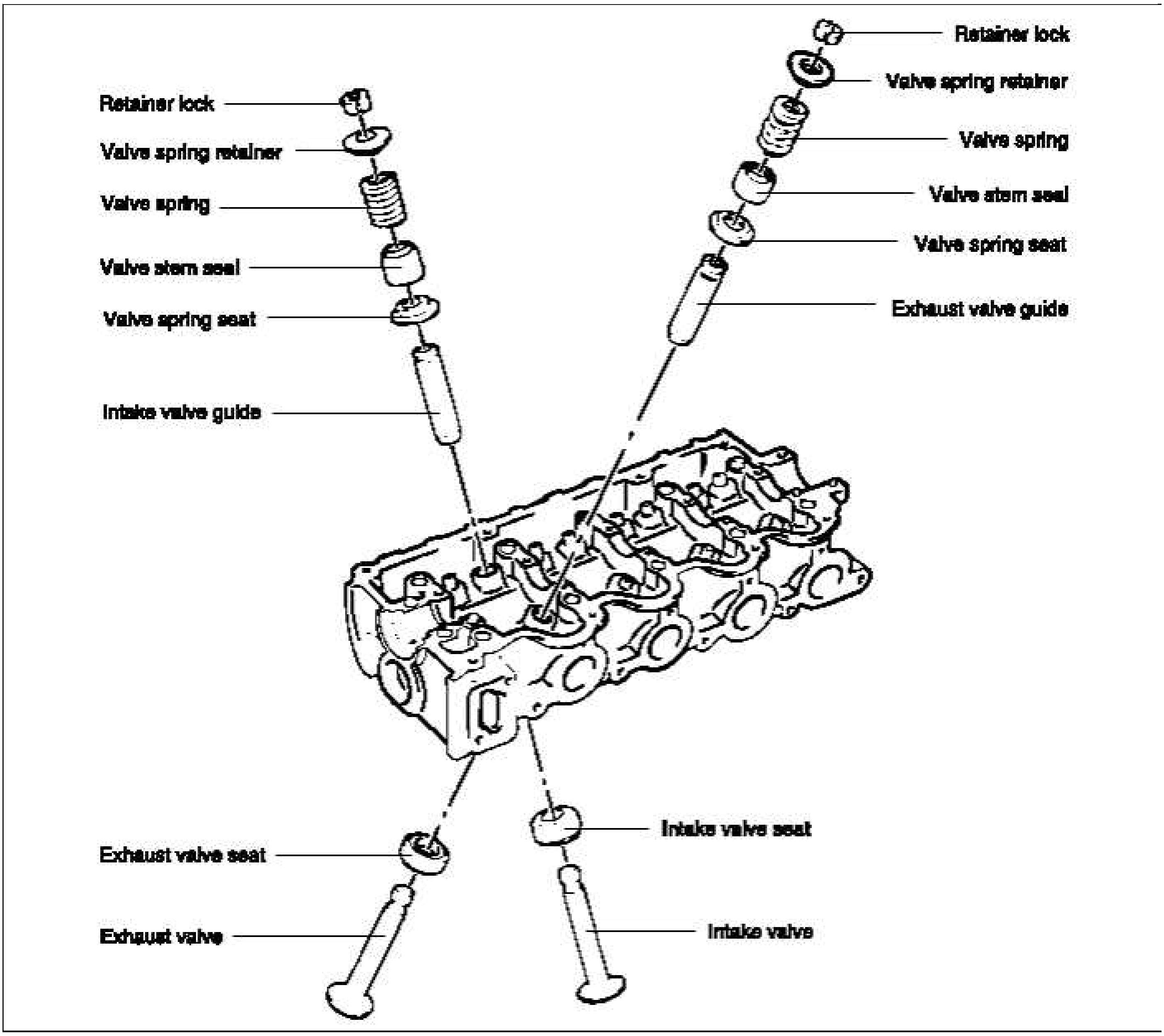
Tightening torque
Surge tank to inlet manifold nuts and bolts :
15 ~ 20 Nm (250 ~ 200 kg.cm, 11 ~ 15 lb.ft)

---

12. Install the ignition coil.
13. Install the air intake hose.
14. Connect the vacuum hose, fuel hose and coolant hose.
15. Install breather hose.

Engine Mechanical System > Cylinder Head Assembly > Cylinder Head > Components and Components Location

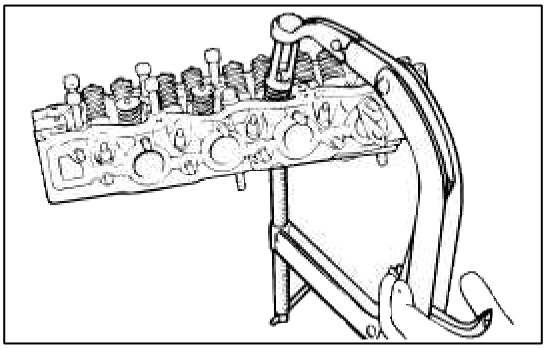
COMPONENTS


Retainer lock
Valve spring retainer
Valve spring
Valve stem seal
Valve spring seat
Exhaust valve guide
Retainer lock
Valve spring retainer
Valve spring
Valve stem seal
Valve spring seat
Intake valve guide
Intake valve seat
Exhaust valve seat
Exhaust valve
Intake valve

Engine Mechanical System > Cylinder Head Assembly > Cylinder Head > Repair procedures

DISASSEMBLY

1. Using the special tool, valve spring remover and installer, remove the retainer lock. Next, remove the spring retainer, vlave spring, spring seat and valve.



NOTE

Keep these parts in order so that they can be rein-stalled in their original positions.

2. Remove the valve stem seals with pliers, and discard them.

> **NOTE**
>
> Do not reuse the valve stem seals.

INSPECTION

VALVE SPRING

1. Check the valve spring free length and tension. If they exceed the service limit, replace the spring.
2. Using a square, test the squareness of each spring.
   If a spring is excessively out of square, replace it.

VALVE SPRING

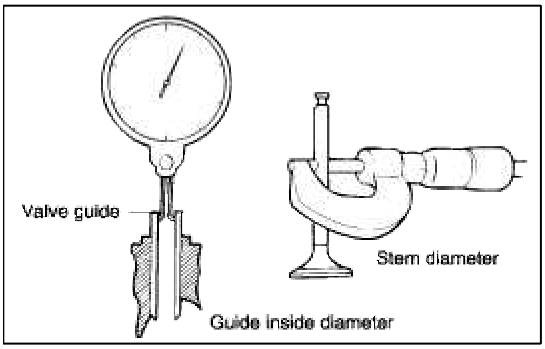
Standard vlaue
Free height : 42.03 mm (1.655 in.)
Load : 24.7 kg at 34.5 mm
Out of square : 1.5° or less

VALVE GUIDES

Check the valve stem-to-guide clearance. If the clearance exceeds the service limit, replace the vlave guide with the next oversize part.

VALVE STEM-TO-GUIDE CLEARANCE

Standard vlaue
Intake : 0.030 ~ 0.060 mm (0.0012 ~ 0.0024 in.)
Exhaust : 0.035 ~ 0.065 mm (0.0014 ~ 0.0026 in.)



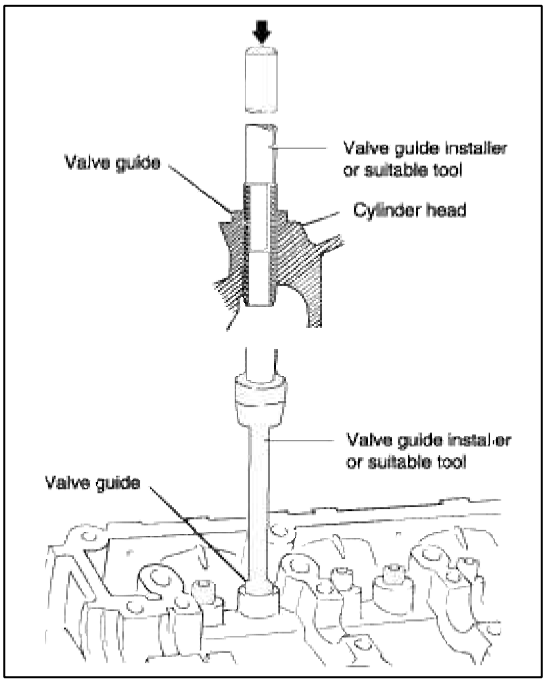
VALVE GUIDE OVERSIZES

Size mm (in.)	Size mark	Cylinder head hole size mm (in.)
0.05 (0.002) O.S.	5	11.05 ~ 11.058 (0.435 ~ 0.4354)
0.25 (0.010) O.S.	25	11.25 ~ 11.258 (0.429 ~ 0.4432)
0.50 (0.020) O.S.	50	11.50 ~ 11.508 (0.4528 ~ 0.4531)

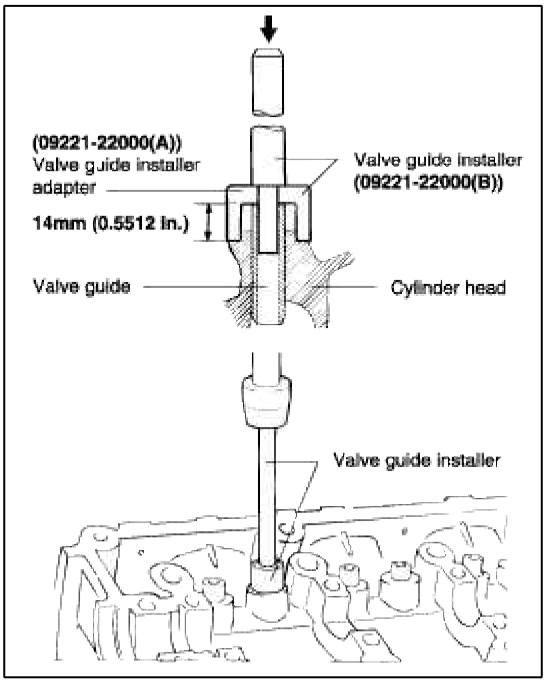
VALVE GUIDE REPLACEMENT PROCEDURES

The valve guide is installed using a press fit. Using Value Guide installer (09221- 21200 A/B or suitable tool, replace the valve guide described in the following procedure.

1. Using the valve guide installer push rod, push the valve guide out toward the cylinder block with a press.

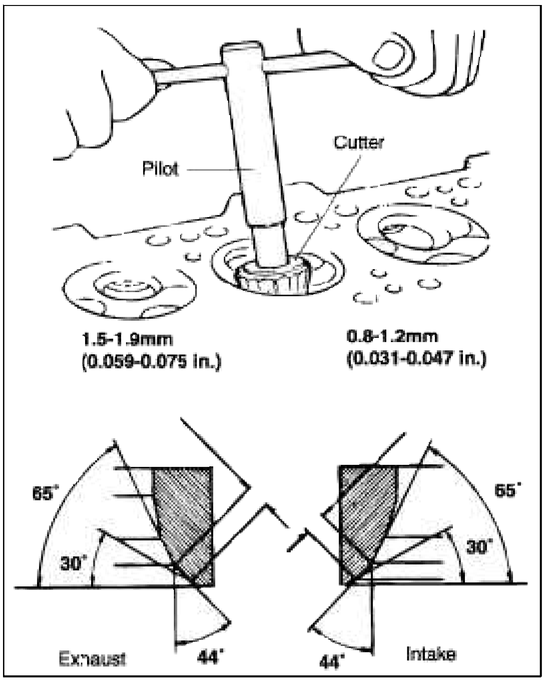

Valve guide
Valve guide installer or suitable tool
Cylinder head
Valve guide installer or suitable tool
Valve guide

2. Machine the valve guide insert hole in the cylinder head to the specified oversize of the new valve guide.
3. Using the valve guide installer or suitable tool, press fit the valve guide. Using the vlalve guide installer makes it possinle to press fit the valve guide to a predetermined height. Install the vlave guide from the top of the cylinder head. Note that intake and exhaust valve guides differ in length.
4. After installing the valve guides, insert new valves and check the clearance.


(09221-22000(A))
Valve guide installer adapter
14mm (0.5512 In.)
Valve guide
Valve guide installer (09221-22000(B))
Cylinder head
Valve guide installer

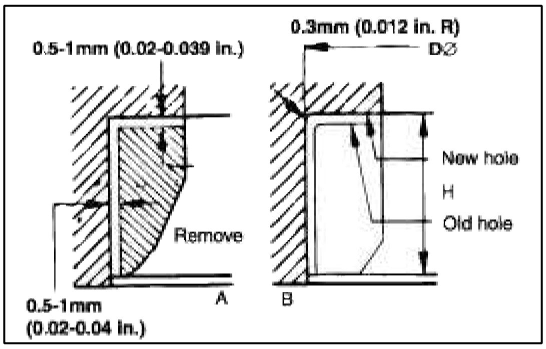
5. Whenever valve guides are replaced, check for valve-to-seat contact, and recondition the valve seats as necessary.

VALVE SEAT INSERT


Pilot
Cutter
1.5-1.9mm
(0.059-0.075 in.)
0.8-1.2mm
(0.031-0.047 in.)
65°
30°
65°
30°
Exhaust
44°
44°
Intake

VALVE SEAT INSERT REPLACEMENT PROCEDURE

1. Any valve seat insert that has been worn over the service limit should be removed at normal temperature after cutting away most of the insert wall, using valve seat cutters, as shown in Fig A.
2. After removing the seat insert, machine the seat insert bore using a reamer or a cutter. Cut to the size shown in the table.
3. Heat the cylinder head to about 250°C (480°F) and press in the oversize seat insert. The oversize seat insert should be at normal room temperature for installation. After installing a new valve seat insert, resurface the valve seat using the same procedure described in the first paragraph of "Valve Seat Insert" (above).

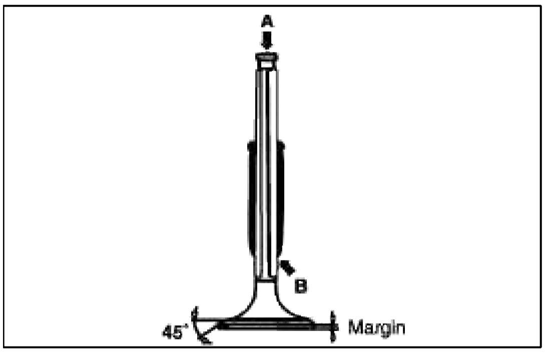

0.5-1mm (0.02-0.039 in.)
0.3mm (0.012 in. R)
DØ
New hole
H
Old hole
Remove
0.5-1mm
(0.02-0.04 in.)
A
B

VALVE SEAT INSERT OVERSIZES

Description	Size mm (in.)	Size mark	Seat insett height H mm (in.)	Cylinder head I.D. mm (in.)
Intake valve seat insert	0.3 (0.012) O.S.	30	5.1~5.3 (0.201~0.2069)	28.80~28.821(1.134~1.135)
	0.6(0.024) O.S.	60	5.4~5.6 (0.213~0.220)	29.10~29.121(1.146~1.147)
Exhaust valve seat insert	0.3 (0.012) O.S.	30	5.9~6.1 (0.232~0.240)	34.30~34.325(1.350~1.351)
	0.6 (0.024) O.S.	60	6.2~6.4(0.244~0.252)	34.60~34.625(1.362~1.363)

VALVES

Check each valve for wear, damage and distortion of head and stem (B). Repair or correct, if necessary. If stem end (A) is pitted or worn, resurface. This correction must be limited to a minimum. Also, resurface the valve face.



MARGIN

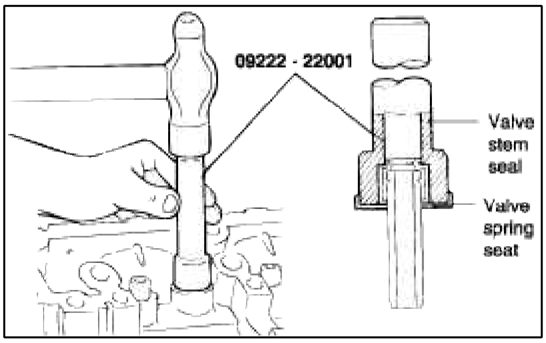
Standard value
Intake : 1.1 mm (0.043 in.)
Exhaust : 1.4 mm (0.055 in.)
Limit
Intake : 0.8 mm (0.031 in.)
Exhaust : 1.1 mm (0.043 in.)

REASSEMBLY

NOTE

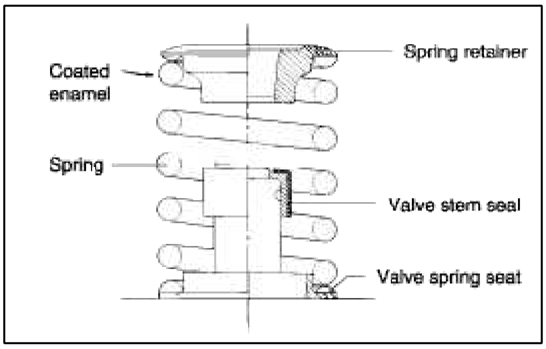
1. Thoughly clean each part before assembly.
2. Apply engine oil to sliding and rotating parts.

1. After installing the spring seat, fit the stem seal into the valve guide.
   To install, fit the seal in by lightly tapping the Special Tool, Valve Stem Oil Seal Installer.
   The seal is installed in the specified position by means of the special tool. Incorrect installation of the seal will adversely affect the lip I.D. and eccentricity, resulting in oil leaking down the valve guides. Therefore, when installing, be careful not to twist the seal. Do not reuse old stem seals.

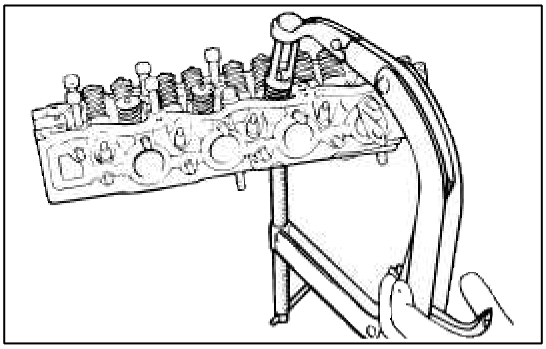
   

2. Apply engine oil to each valve. Insert the valves into the valve guides. Avoid using force when inserting the valve into the seal. After insertion, check to see if the valve moves smoothly.

3. Install springs and spring retainers. Valve springs should be installed with the enamel coated side toward the valve spring retainer.
   Valve springs should be installed with the enamel coated side toward the valve spring retainer.



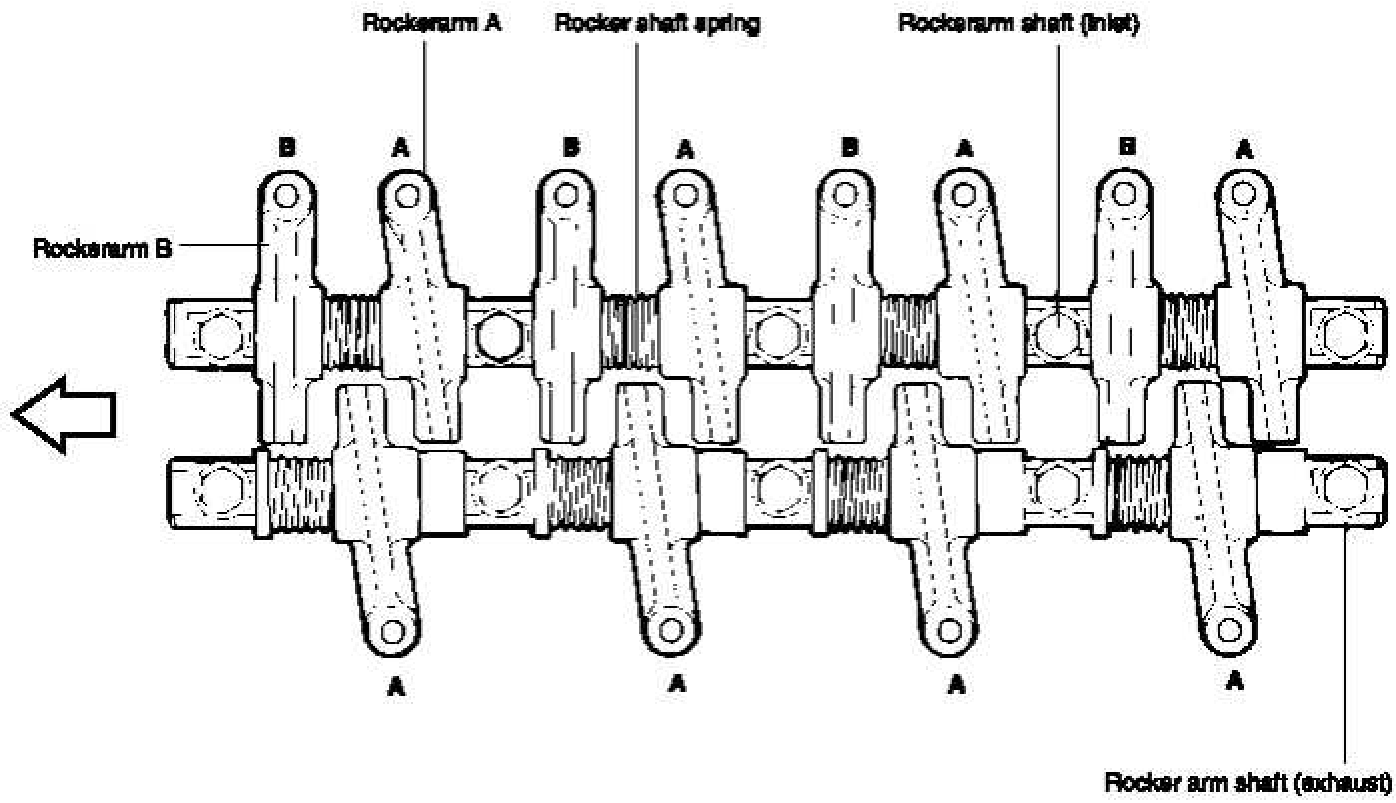
4. Using special tool, valve spring remover and installer, compress the spring. Be careful that the valve stem seal is not distorted by the bottom of the retainer. Then install the retainer locks. After installation of the valves, make certain that the retainer locks are properly installed.



5. Install the cylinder head. Refer to "Cylinder Head"

Engine Mechanical System > Cylinder Head Assembly > Rocker Arm > Components and Components Location

COMPONENTS

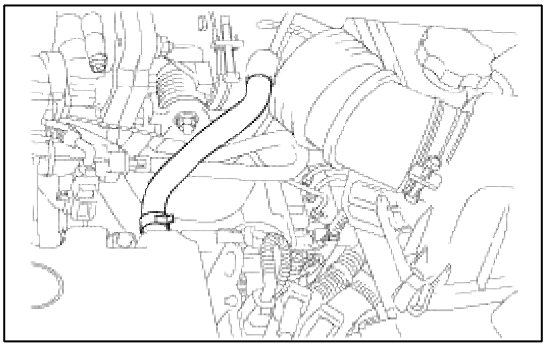

Rockerarm A
Rocker shaft spring
Rockerarm shaft (inlet)
B
A
B
A
B
A
B
A
Rockerarm B
A
A
A
A
Rocker arm shaft (exhaust)

TORQUE : Nm (kg-cm, lb-ft)

Engine Mechanical System > Cylinder Head Assembly > Rocker Arm > Repair procedures

DISASSEMBLY

1. Remove the breather hose and PCV valve.



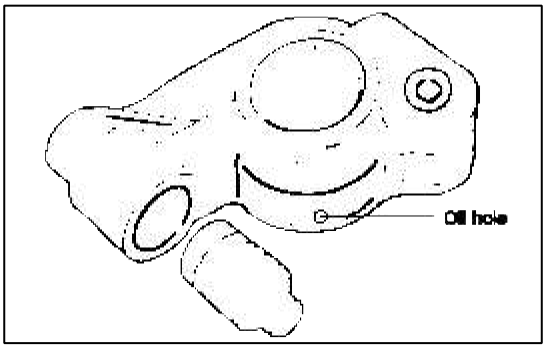
2. Remove the timing belt cover.
3. Remove the rocker cover.
4. Loosen the flange bolts and remove the rocker arm shaft, rocker arms and rocker arm shaft springs as an assembly.
5. Remove the bolts, the rocker arms and arm shaft springs from the rocker arm shaft.

INSPECTION

ROCKER ARM

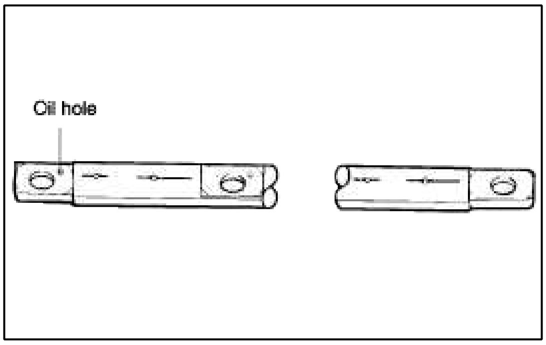
1. Check the rocker face.
   Replace it damaged or pressed.

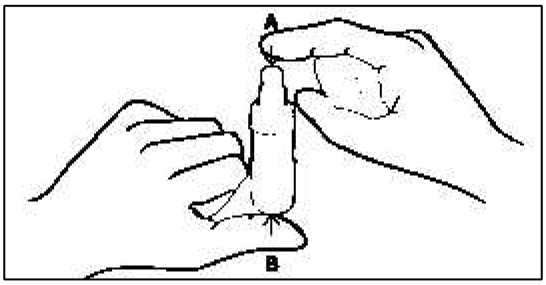
2. Check the contact surface on the cam and valve stem.
   If badly worn or damaged, replace it.
3. Check the hydraulic lash adjuster (HLA) face that contact the valve stem. If badly worn or damaged, replace the HLA.



ROCKER ARM SHAFT

1. Check the rocker arm shafts for damage. Replace as necessary.
2. Check the oil hole for any restriction.





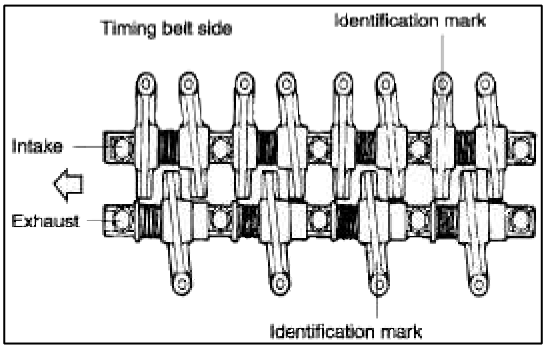
Problem	Possible cause	Action
• Temporary noise on starting a cold engine	Normal	This noise will disappear after the oil in the engine has reached normal pressure.
• Continuous noise when engine is started after longer than 48 hours parking.	Oil drain out of the high pressure chamber on HLA, allowing air to get in.	Noise will disappear within 15 minutes of engine running at 2000~3000 rpm If not refer to item 7 below
• Continuous noise when engine is first started after rebuilding cylinder head.	Insuffecient oil in cylinder head oil gallery.	
• Continuous noise when engine is after excessive craking the engine by starter motor or band.	Oil drain out of the high-pressure chamber in HLA, allowing air to get in.	
• Continuous noise after changing HLA.		Do not run engine at a speed higher than 3000 rpm as this may damage HLA.

• Continuous noise during idle after high speed running.	Engine oil level too high or too low.	Check oil level. Drain or add oil as necessary.
	Execssive amount of air in the oil at high engine speed.	Check oil supply system
	Deteriorated oil	Check oil quality. If deteriorated, replace with specified type and amount of oil.
• Noise cotinues more than 15 minutes.	Low oil pressure	Check oil pressure and oil supply system of each part of engine.
	Faulty HLA.	Remove the cylinder head over and press down HLA by band. If it moves, replace HLA. CAUTION Be careful of hot HLA.

REASSEMBLY

1. Install the rocker arms and rocker arm shaft springs to the rocker arm shafts, install the rocker arm shaft to the cylinder head.
   Tighten the rocker arm shaft mounting bolts to the specified torque.

   Tightening torque
   Rocker arm shaft mounting bolt :
   20 ~ 27 Nm (200 ~ 270 kg.cm, 15 ~ 20 lb.ft)



2. When installing the rocker arm, shaft and spring, mark the difference between left and right parts.
   Use the springs without distinction of intake and exhaust valve.
   Must set the parts that have smaller chamfers between rocker arm shafts.

3. Install the rocker cover and tighten the bolts to the specified torque.

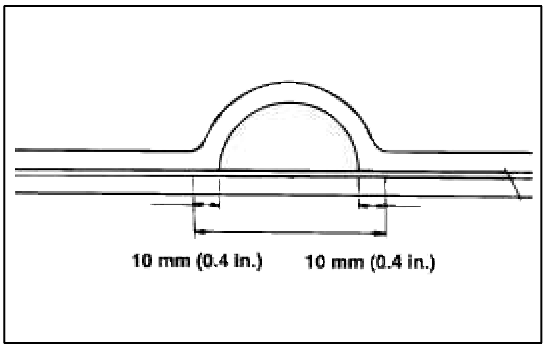
Tightening torque

Rockr cover bolt :

8 ~ 10 Nm (80 ~ 100 kg.cm, 6 ~ 7 lb.ft)

CAUTION

1. Sealant must be applied to the top surface of cylinder head and cam caps. Area of application is shown in figure.
2. The proper amount of sealant must be used to prevent the sealant from squeezing out the sides..
3. Use sealant of specified brands or equivalant.
4. Sealant (Three bond No. 1212D aluminum color or equivalent).



4. Install the timing belt cover.

Tightening torque

Timing belt cover bolt :

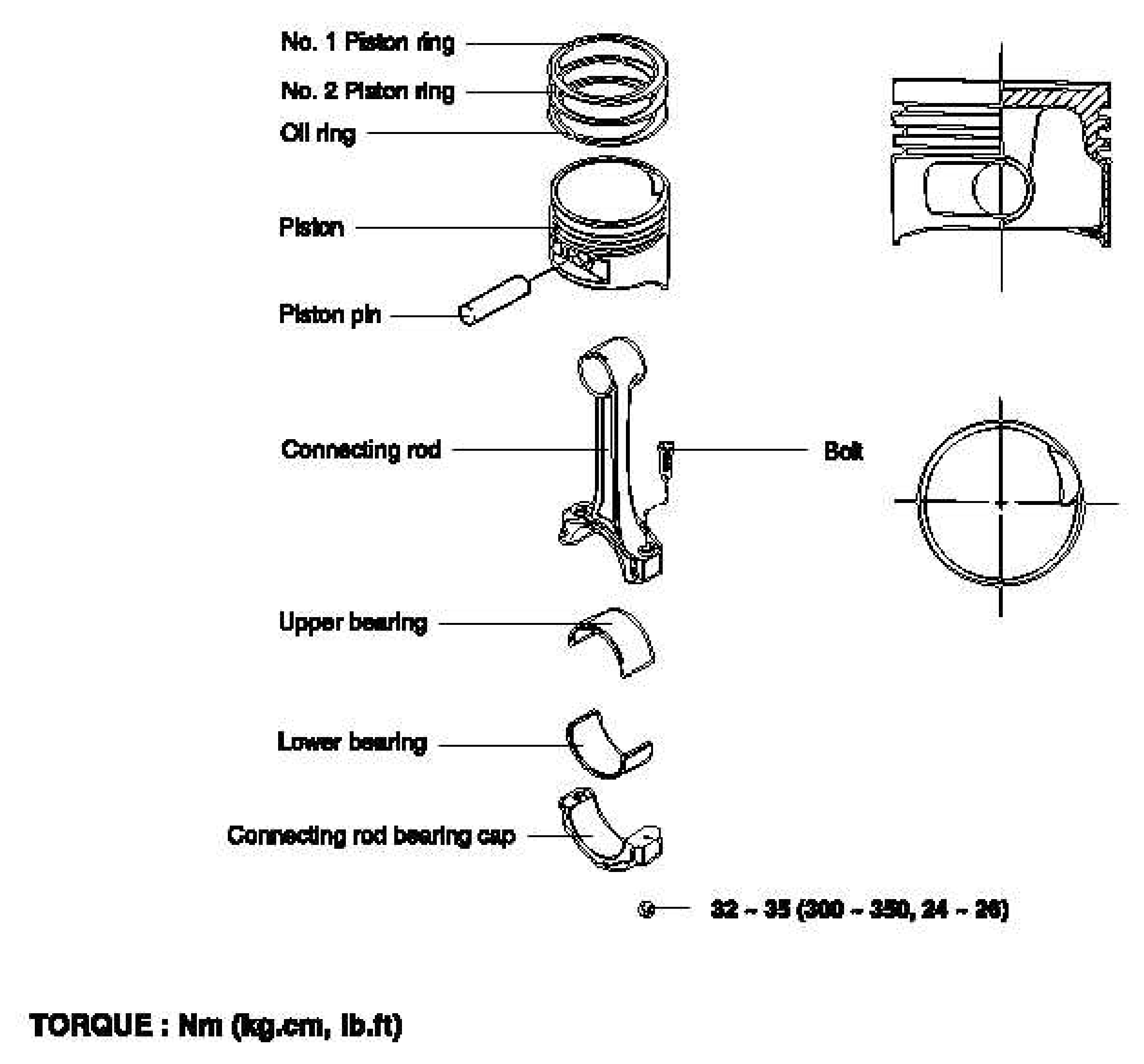
10 ~ 12 Nm (100 ~ 120 kg.cm, 7 ~ 9 lb.ft)

---

5. Install the breather hose, PCV hose, blow by hose and spark plug cable.
6. Install the air intake hose and air duct.

Engine Mechanical System > Cylinder Block > Piston and Connecting Rod > Components and Components Location

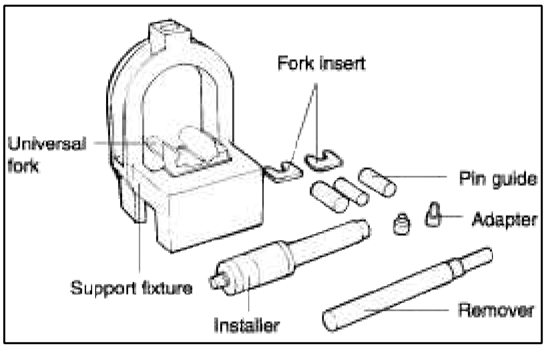
COMPONENTS


No. 1 Piston ring
No. 2 Piston ring
Oil ring
Piston
Piston pin
Connecting rod
Bolt
Upper bearing
Lower bearing
Connecting rod bearing cap
32 ~ 35 (300 ~ 350, 24 ~ 26)
TORQUE : Nm (kg.cm, lb.ft)

Engine Mechanical System > Cylinder Block > Piston and Connecting Rod > Repair procedures

DISASSEMBLY

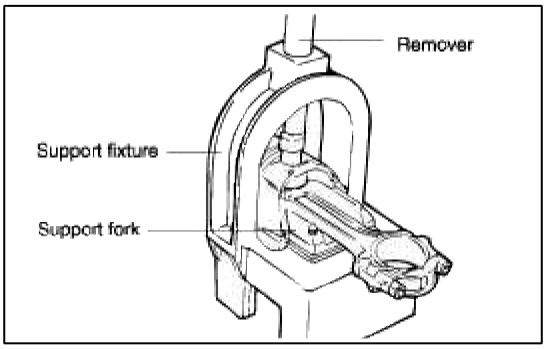
1. Use the Special Tools (09234-33001) to disassemble and reassemble the piston and connecting rod.


Fork insert
Universal fork
Pin guide
Adapter
Support fixture
Installer
Remover

2. Place the proper fork inserts in the fork of the tool.
   Between the connecting rod and the piston.
3. Insert the proper removal tool through the hole in the arch of the tool.

> NOTE
>
> Center the piston, rod and pin assembly with the removal arbor.

4. Press the piston pin out of the connecting rod.



INSPECTION

PISTON AND PISTON PINS

1. Check each piston for scuffing, scoring wear, and other defects. Replace any piston that is defective.
2. Check each piston ring for breakage, damage and abnormal wear. Replace the defective rings. When the piston requires replacement, also replace the rings.
3. Check the piston pin fit in the piston pin hole. Replace any defective piston and pin assembly that is defective. The piston pin must be smoothly pressed by hand into the pin hole (at room temperature).

PISTON RINGS

1. Measure the piston ring side clearance. If the measured value exceeds the service limit, insert a new ring in a ring groove to measure the side clearance. If the clearance still exceeds the service limit, replace the piston and rings together. If it is less than the service limit, replace only the piston rings.

Piston ring side clearance
Standard value
No. 1 : 0.04 ~ 0.085 mm (0.0016 ~ 0.0033 in.)
No.2 : 0.04 ~ 0.085 mm (0.0016 ~ 0.0033 in.)
Limit
No. 1 : 0.1 mm (0.004 in.)
No. 2 : 0.1 mm (0.004 in.)

2. To measure the piston ring end gap, insert a piston ring into the cylinder bore. Position the ring at right angles to the cylinder wall by gently pressing it down with a piston Measure the gap with a feeler gauge. If the gap exceeds the service limit, replace the piston ring.

Item	Standard - mm (in.)	Limit - mm (in.)
Piston ring end gap No.1	0.20 ~ 0.35 (0.0079 ~ 0.0138)	1 (0.039)
Piston ring end gap No.2	0.37 ~ 0.52 (0.015 ~ 0.02)	1 (0.039)
Oil ring side rail end gap	0.20 ~ 0.70 (0.078 ~ 0.0275)	1 (0.039)

When replacing the ring without correcting the cylinder bore, check the gap with the ring positioned at the bottom of the ring travel.
When replacing a ring, use a ring of the same size.

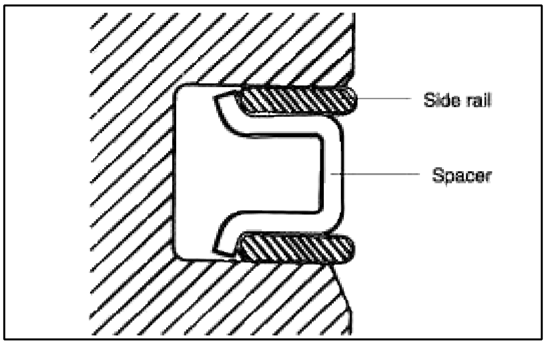
Piston ring service size and mark
STD : None
0.25 mm (0.010 in.) O.S. : 25
0.50 mm (0.020 in.) O.S. : 50
0.75 mm (0.030 in.) O.S. : 75
1.00 mm (0.039 in.) O.S. : 100

NOTE

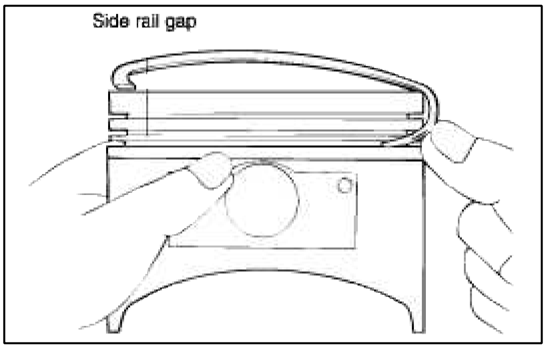
The mark can be found on the upper side of the ring.

REASSEMBLY

1. Install the spacer.



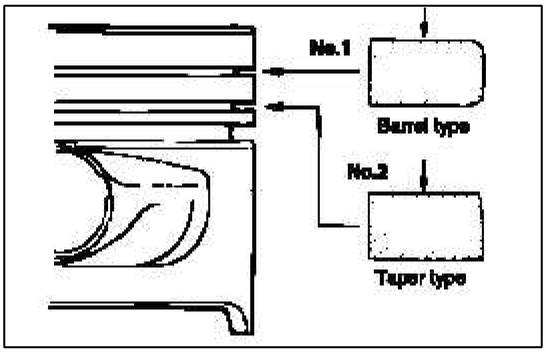
2. Install upper side rail. To install side rail, first put one end of side rail between piston ring groove and spacer, hold it down firmly, then press down the portion to be inserted with your finger into groove as illustrated.



NOTE

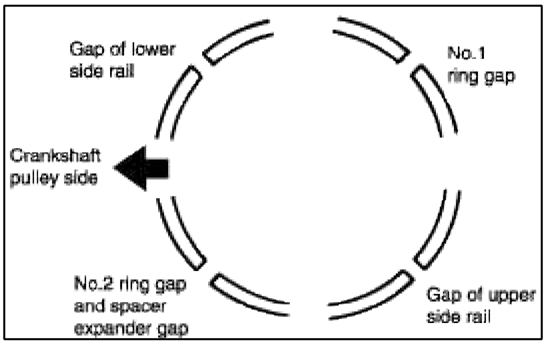
Do not use piston ring expander when installing side rail.

3. Install lower side rail using same procedure as Step 2.
4. Using piston ring expander, install No. 2 piston ring.
5. Install No. 1 piston ring.



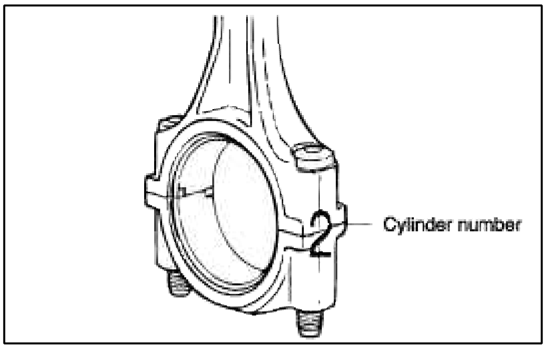
6. Apply engine oil around piston and piston rings.

7. Position each piston ring end gap as far apart from neighboring gaps as possible. Make sure that gaps are not positioned in side rail thrust and pin directions.
8. Hold piston rings firmly in a piston ring compressor as you insert them into cylinder.


Gap of lower side rail
No.1 ring gap
Crankshaft pulley side
No.2 ring gap and spacer expander gap
Gap of upper side rail

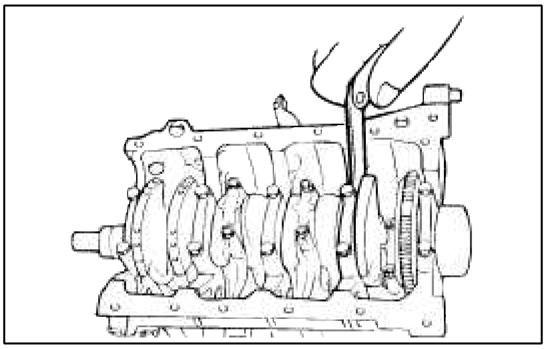
9. Make sure that the front mark of piston and the front mark (identification mark) of connecting rod are directed toward front of engine.
10. When connecting rod cap is installed, make sure that cylinder numbers put on rod and cap at disassembly match each other.
11. When new connecting rod is installed, make sure that notches for holding bearing in place are on same side.
12. Tighten the connecting rod cap nuts.

Tightening torque
Connecting rod cap nuts
32 ~ 35 Nm (320 ~ 350 kg.cm, 24 ~ 26 lb.ft)


2
Cylinder number

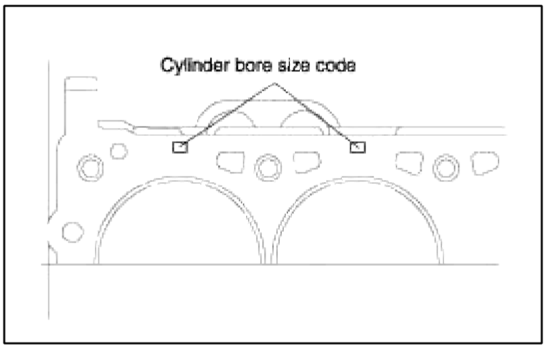
13. Check connecting rod side clearance.

Connecting rod side clearance
Standard value : 0.10 ~ 0.25 mm (0.004 ~ 0.0098 in.)
Limit : 0.4 mm (0.0157 in.)



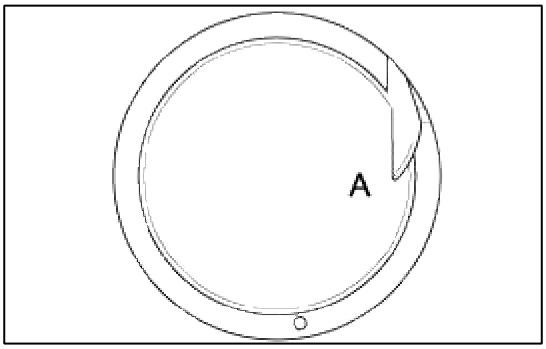
REPLACEMENT

1. Check the cylinder bore size code on the cylinder block top face.



Class	Cylinder bore inner diameter	Size code
A	75.5 ~ 75.51 mm (2.9724 ~ 2.9728 in.)	A
B	75.51 ~ 75.52 mm (2.9728 ~ 2.9732 in.)	None
C	75.52 ~ 75.53 mm (2.9732 ~ 2.9736 in.)	C

2. Check the piston size code on the piston top face.



Class	Piston outer diameter	Size code
A	75.47 ~ 75.48 mm (2.9712 ~ 2.9716 in.)	A
B	75.48 ~ 75.49 mm (2.9716 ~ 2.9720 in.)	None
C	75.49 ~ 75.50 mm (2.9720 ~ 2.9724 in.)	C

3. Selece the piston related to cylinder bore class.

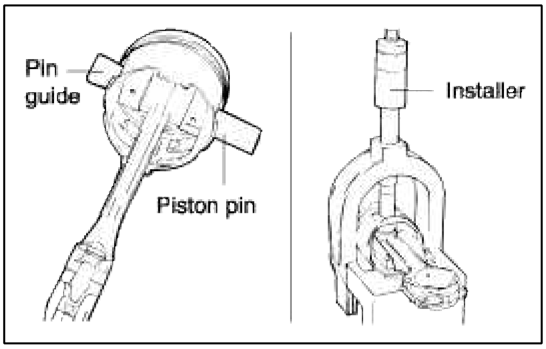
Oil clearance : 0.02 ~ 0.04 mm (0.00078 ~ 0.00157 in.)

INSTALLATION

1. Install proper pin guide through piston and into connecting rod. Hand tap pin guide into piston for proper retention. Drop piston pin into the other side of the piston.

NOTE

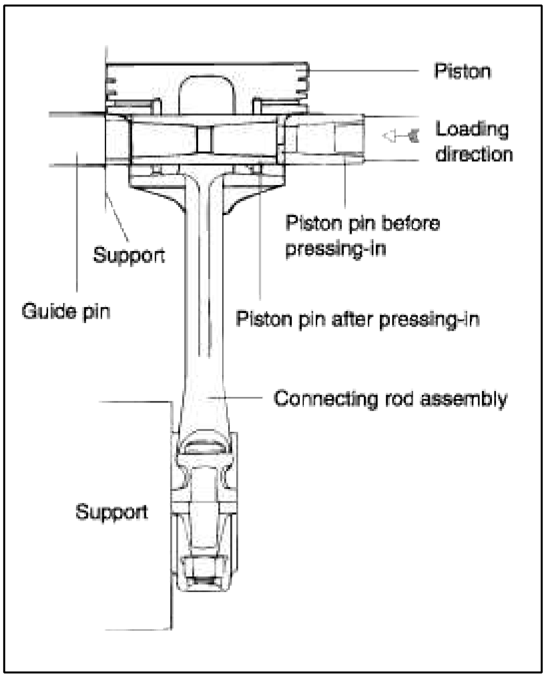
The pin guide centers the connecting rod in the piston. When the piston, connecting rod, piston pin and pin guide assembly are positioned on the fork of the tool, the pin guide will also center this assembly in the tool.If too small a pin guide is used, the piston assembly will not be located centrally in the tool, and damage may occur to the fork and/or insert of the tool.


Pin guide
Piston pin
Installer

2. Install piston assembly onto fork assembly of tool.
   Tool will support connecting rod at the piston pin. Be sure to slide the piston assembly into the fork until the pin guide contacts the fork insert.
3. Adjust the installing arbor to the proper length by turning the numbered sleeve on the lettered shaft until the specified alpha-numeric setting from the application chart is obtained. Turn knurled nut to lock numbered sleeve on shaft.
4. Insert the installing arbor through the hole in the arch of the tool. Press the piston pin into the connecting rod until the sleeve on the installing arbor contacts the top of the tool arch. The pin guide will fall out of the connecting rod as the piston pin is pressed in.

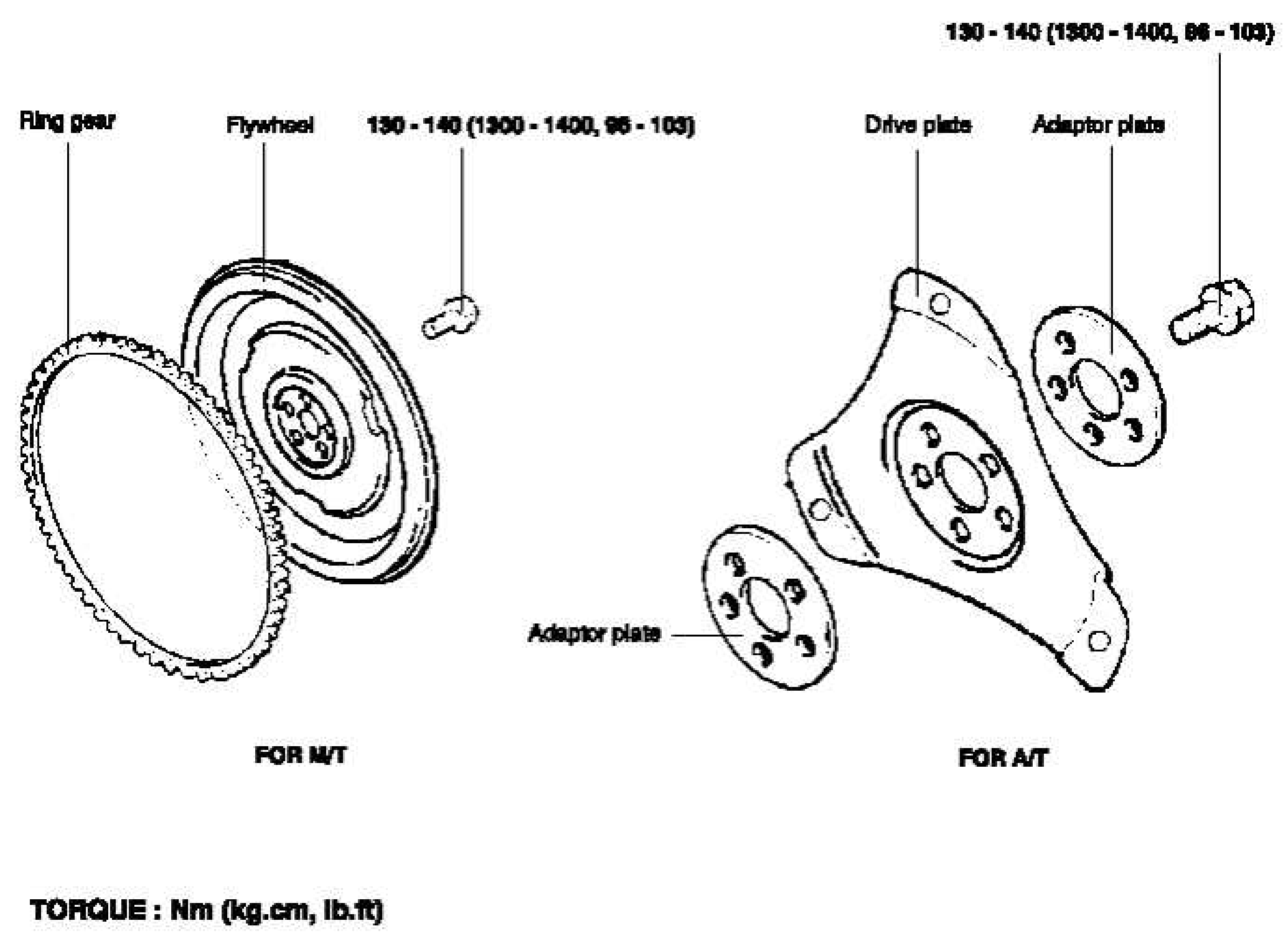
CAUTION

Do not exceed 5000 pounds of force when stopping the installing arbor sleeve against the arch.

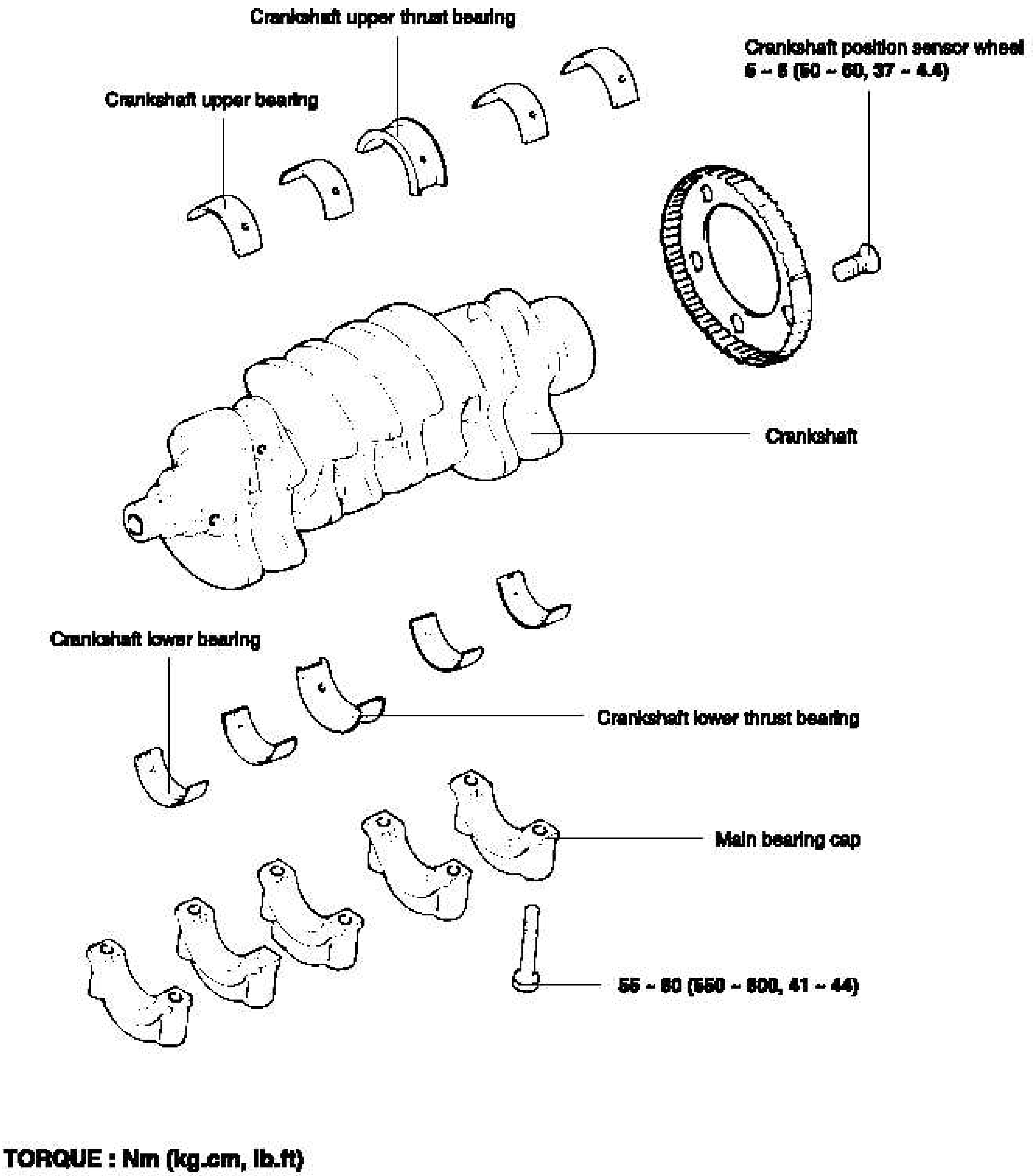

Piston
Loading direction
Support
Piston pin before pressing-in
Guide pin
Piston pin after pressing-in
Connecting rod assembly
Support

Engine Mechanical System > Cylinder Block > Crankshaft > Components and Components Location

COMPONENTS


130 - 140 (1300 - 1400, 96 - 103)
Ring gear
Flywheel
130 - 140 (1300 - 1400, 96 - 103)
Drive plate
Adaptor plate
Adaptor plate
FOR M/T
FOR A/T
TORQUE : Nm (kg.cm, lb.ft)

COMPONENTS


Crankshaft upper thrust bearing
Crankshaft position sensor wheel
5 ~ 6 (50 ~ 60, 37 ~ 4.4)
Crankshaft upper bearing
Crankshaft
Crankshaft lower bearing
Crankshaft lower thrust bearing
Main bearing cap
55 ~ 60 (550 ~ 600, 41 ~ 44)
TORQUE : Nm (kg.cm, lb.ft)

Engine Mechanical System > Cylinder Block > Crankshaft > Repair procedures

DISASSEMBLY

1. Remove the transaxle and clutch.
2. Remove the flywheel.

DISASSEMBLY

1. Remove the timing belt train, front case, flywheel cylinder head assembly and oil pan. For details, refer to related chapters.
2. Remove the rear plate and the rear oil seal.

3. Remove the connecting rod caps.
4. Remove the main bearing caps and remove the crankshaft. Keep the bearings in order according to the cap number.
5. Remove the crankshaft position sensor wheel.

> **CAUTION**
>
> Mark the main bearing caps to permit reassembly in the original position and direction.

INSPECTION

1. Check the clutch disc contacting surface of the fly wheel for damage and wear. Replace the flywheel if excessively damaged or worn.
2. Check the clutch disc contacting surface of the fly wheel for runout.

Standard value
Flywheel run-out : 0.1 mm (0.004 in.)

---

3. Check the ring gear for damage, crack and wear, and replace if necessary.

INSPECTION

CRANKSHAFT

1. Check the crankshaft journals and pins for damage, uneven wear and cracks. Also check oil holes for clogging. Correct or replace any defective part.
2. Inspect out-of-roundness and taper of crankshaft journal and pin.

Standard value
Crankshaft journal O.D. : 50 mm (1.9685 in.)
Crankshaft pin O.D. : 45 mm (1.7717 in.)
Crankshaft journal, pin out-of-roundness and taper :
0.01 mm (0.0004 in.) or less

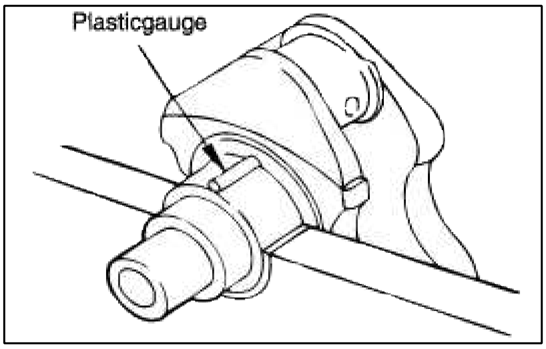
MAIN BEARINGS AND CONNECTING ROD BEARINGS
OIL CLEARANCE MEASUREMENT

Standard value
Journal oil clearance No. 1, 2, 4, 5 :
0.028 ~ 0.046 mm (0.0011 ~ 0.0018 in.)
Journal oil clearance No. 3 (center) :
0.034 ~ 0.52 mm (0.0013 ~ 0.002 in.)
Pin oil clearance :
0.024 ~ 0.042 mm (0.0009 ~ 0.0017 in.)

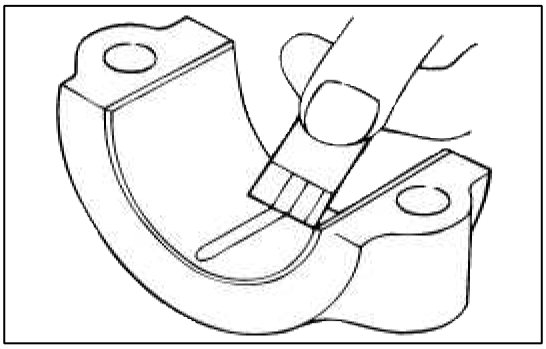
PLASTIC GAUGE METHOD

1. Remove oil, grease and any other dirt from bearings and journals.

2. Cut plastic gauge to the same length as the width of the bearing and place it parallel with the journal, away from the oil holes.



3. Install the crankshaft , bearings, and caps. Tighten them to the specified torque. During this operation, do not turn the crankshaft. Remove the caps.
   Measure the width of the plastic gauge at the widest point using the scale printed on the gauge package.
   If the clearance exceeds the repair limit, replace the bearing.
   Should the standard clearance not be obtained even after bearing replacement, the journal should be machined to a recommended undersize, and a bearing of the same size should be installed.



OIL SEAL

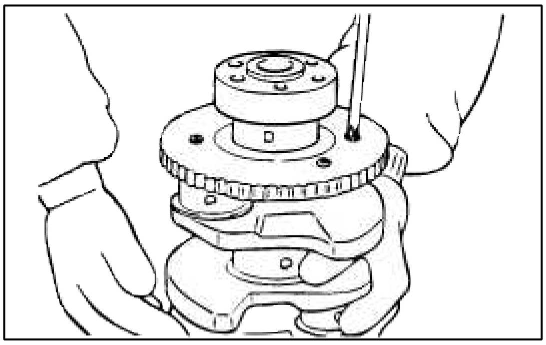
CRANKSHAFT POSITION SENSOR WHEEL

1. Remove the crankshaft position sensor wheel.
2. Check the crankshaft position sensor wheel for damage, cracks and wear. Replace if necessary.
3. Check the clearance between the crankshaft position sensor wheel and the crankshaft position sensor with a depth gage.

Standard value
Clearance between the crankshaft position sensor wheel and crankshaft position sensor :
0.5 ~ 1.5 mm (0.0020 ~ 0.059 in.)

NOTE

1. Measure the depth of the top of the crankshaft position sensor wheel teeth and the outside of transaxle housing.
2. Measure the difference between the crankshaft position sensor length and depth.
3. The crankshaft position sensor length is the distance between the end of crankshaft position sensor and inner point of contacting face.



REASSEMBLY

Install the flywheel assembly and tighten the bolts to the specified forque.

Tightening torque
Flywheel bolt :
130 ~ 140 Nm (1300 ~ 1400 kg.cm, 96 ~ 103 lb.ft)

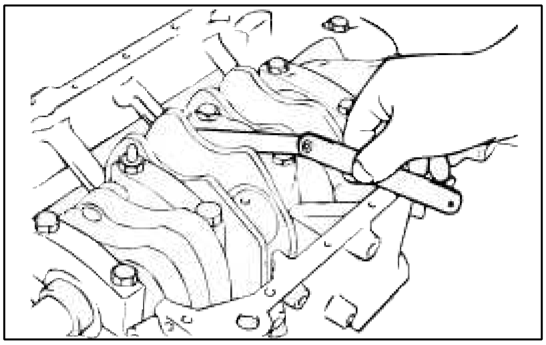
REASSEMBLY

1. Install the upper main bearing inserts in the cylinder block.
2. Install the crankshaft. Apply engine oil to the journals.
3. Install bearing caps and tighten cap bolts to the specified torque in the sequence of the center, No.2, 4, front and rear caps.
   Cap bolts should should be tightened evenly in 2 to 3 stages before they are tightened to the specified torque.
   The caps should be installed with the arrow mark directed toward the crank pulley side of engine. Cap numbers must be correct.

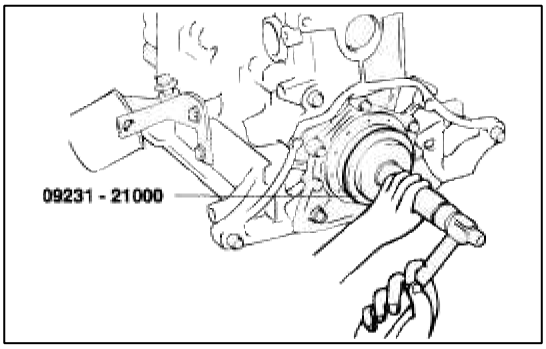
   Tightening torque
   Main bearing cap bolt :
   55 ~ 60 Nm (550 ~ 600 kg.cm, 41 ~ 44 lb.ft)
   Connecting rod cap bolt :
   32 ~ 35 Nm (320 ~ 350 kg.cm, 24 ~ 26 lb.ft)

4. Make certain that the crankshaft turns freely and has the proper clearance between the center main bearing thrust flange and the connecting rod big end bearing.

Standard value
Crankshaft end play :
0.05 ~ 0.175 mm (0.002 ~ 0.005 in.)



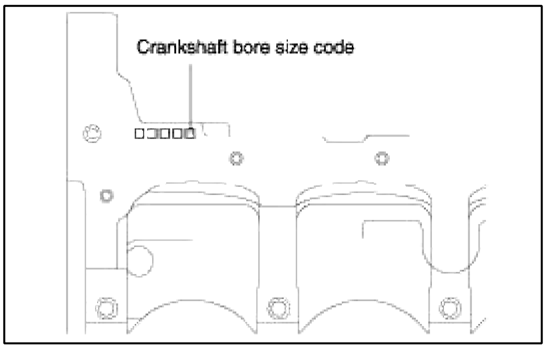
5. Install the oil seal in the crankshaft rear oil seal case.
   Use the special tool, crankshaft rear oil seal installer (09231 - 21000) as shown. Press and fit the oil seal in all the way, being careful not to misalign it.



6. Install the rear oil seal case and gasket. Tighten the five bolts.
   Apply engine oil to the oil seal lips and crankshaft at the time of installation.
7. Install the rear plate and tighten the bolts.
8. Install the connecting rod caps. Refer to the "Piston and Connecting Rods" section.
9. Install the flywheel, front case, oil pan and timing belt.
   For further details, refer to the respective chapters.

REPLACEMENT

1. Check the cylinder block stamping crankshaft bore size code.



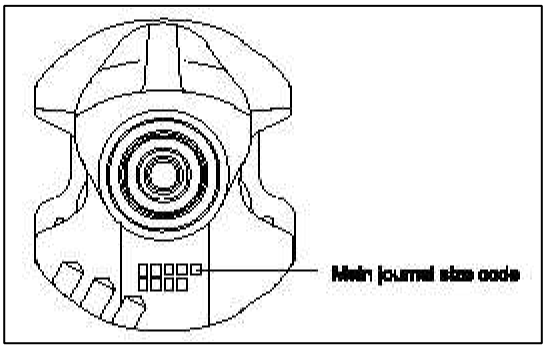
NOTE

Record the cylinder block crankshaft bore size code letters on cylinder block as shown.
Reading order is from left to right with front crankshaft bore size code shown first.

Cylinder block crankshaft bore diameter

Class	Cylinder block crankshaft bore diameter	Size code.
a	54 ~ 54.006 mm (2.1259 ~ 2.1262 in.)	Λ
b	54.006 ~ 54.012 mm (2.1262 ~ 2.1264 in.)	b
c	54.012 ~ 54.016 mm (2.1264 ~ 2.1266 in.)	c

2. Check the crankshaft main journal



NOTE

Record the main journal size code letters on the crankshaft blance weight.
Reading order is from left to right as shown, with no.1 main journal size code shown first.

CRANKSHAFT MAIN JOURNAL DIAMETER

Class	Main journal diameter	Size code.
I	49.968 ~ 49.962 mm (1.9672 ~ 1.9670 in.)	Λ
II	49.962 ~ 49.956 mm (1.9670 ~ 1.9667 in.)	b
III	49.956 ~ 49.950 mm (1.9667 ~ 1.9665 in.)	c

MAIN JOURNAL BEARING THICKNESS

No. 1, 2, 4, 5

Color	Main journal bearing thickness
Yellow	2.002~2.005mm (0.0788~0.0789in.)
Green	2.005~2.008mm (0.0789~0.0790in.)
No color	2.008~2.011mm (0.0790~0.0791in.)
Black	2.011~2.014mm (0.0791~0.0793in.)
Blue	2.014~2.017mm (0.0793~0.0794in.)

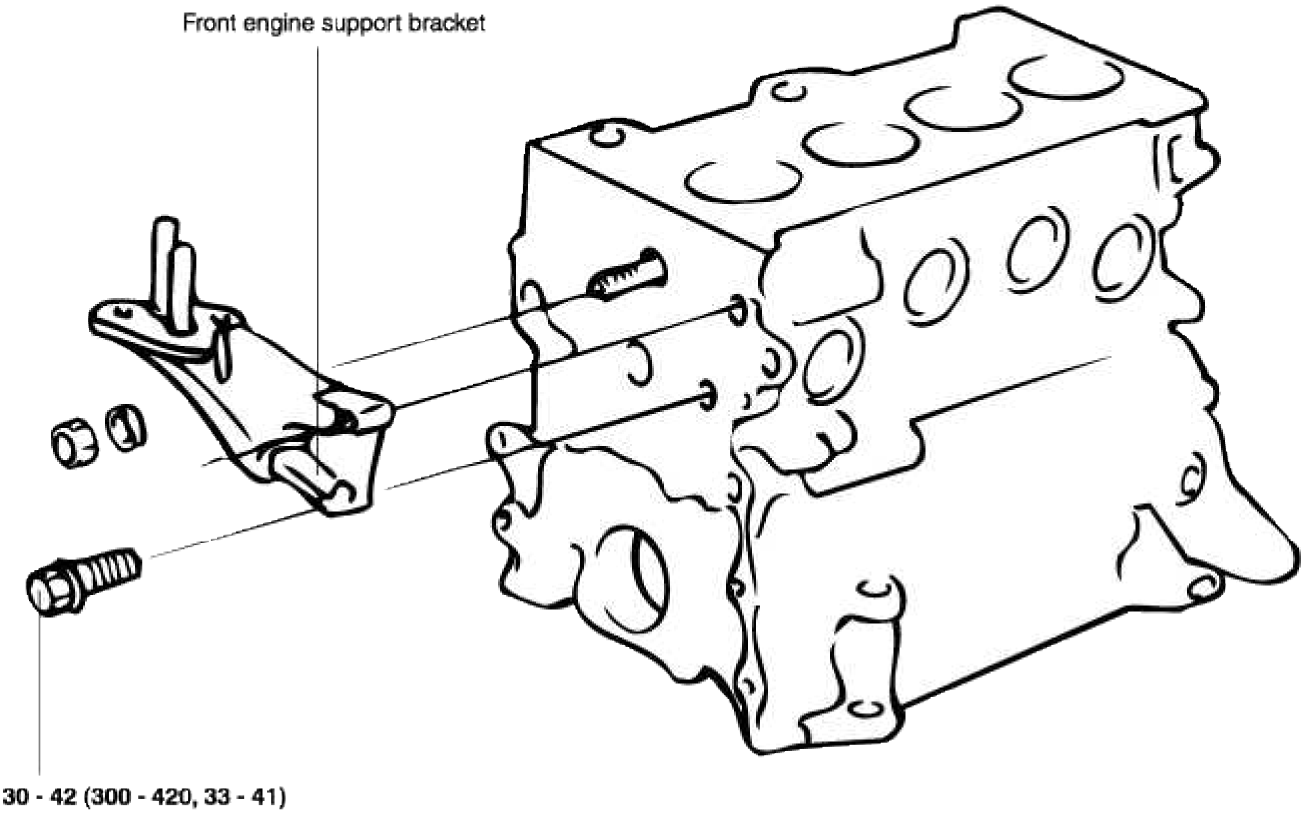
No.3 (Center bearing)

Color	Main journal bearing thickness
Yellow	1.999~2.002mm (0.0787~0.0788in.)
Green	2.002~2.005mm (0.0788~0.0789in.)
No color	2.005~2.008mm (0.0789~0.0790in.)
Black	2.008~2.011mm (0.0790~0.0791in.)
Blue	2.011~2.014mm (0.0791~0.0793in.)

3. Choose proper main journal bearing in table.

Engine Mechanical System > Cylinder Block > Cylinder Block > Components and Components Location

COMPONENTS


Front engine support bracket
30 - 42 (300 - 420, 33 - 41)

TORQUE : Nm (kg.cm, lb.ft)

Engine Mechanical System > Cylinder Block > Cylinder Block > Repair procedures

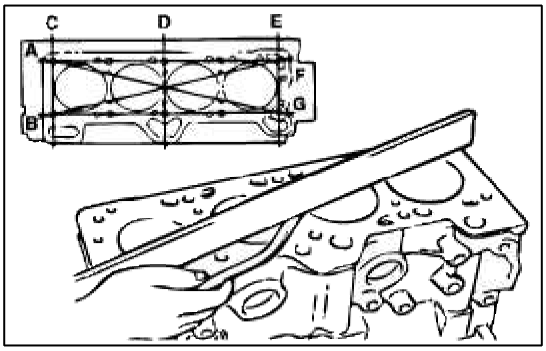
INSPECTION

CYLINDER BLOCK

1. Visually check the engine block for scores, rust and corrosion. Also check for cracks or any other defects. Repair or replace the block if defective.

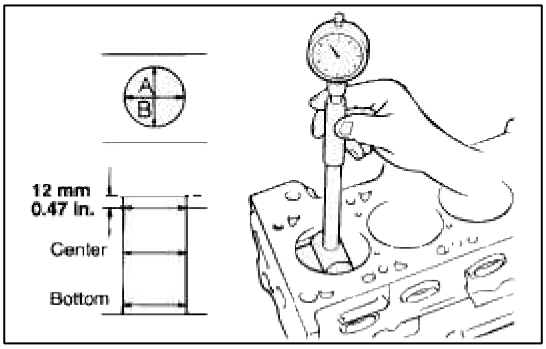
2. Using a straight edge and feeler gauge, check the block top surface for warpage. Make sure that the surface is free from gasket chips and other foreign matter.

Standard : 0.05 mm (0.0020 in.) or less
Limit : 0.1 mm (0.0039 in.)



3. Measure the cylinder bore with a cylinder gauge at three levels in the directions A and B. If the cylinder bores show more than the specified out-of-round-ness or taper or if the cylinder walls are badly scuffed or scored, the cylinder block should be rebored and honed. New oversize pistons and rings must be fitted. Measuring points are as shown.

Cylinder I.D. : 75.5 mm (2.9724 in.)
Cylinder I.D. taper : 0.02 mm (0.0008 in,.) or less



4. If a cylinder ridge exists, cut away with a ridge reamer.
5. Oversize pistons are available in four sizes

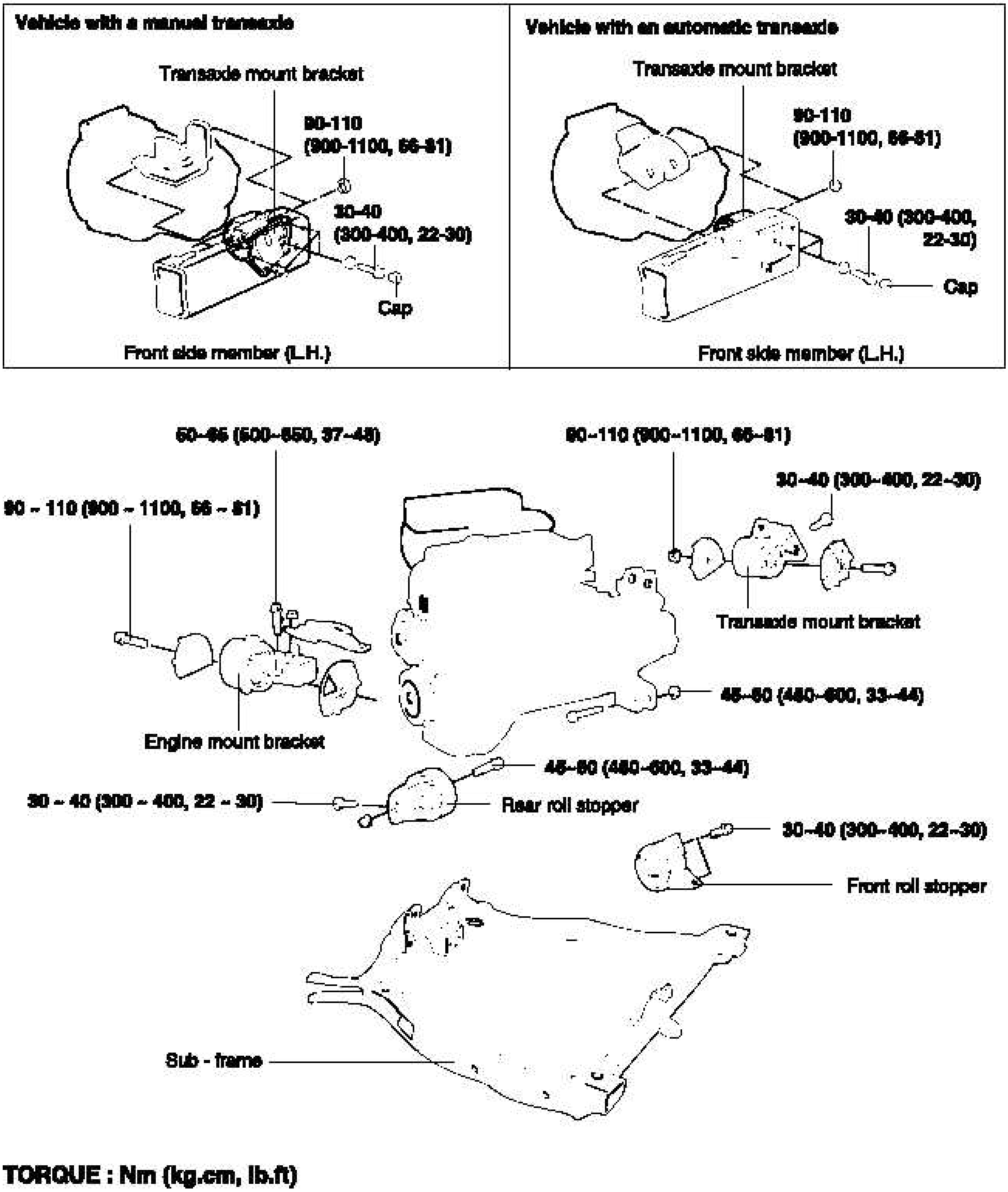
Piston service size and mark mm (in.)
0.25 (0.010) O.S. : 25
0.50 (0.020) O.S. : 50
0.75 (0.030) O.S. : 75
1.00 (0.039) O.S. : 100

6. When boring the cylinder bore to oversize, keep the specified clearance between the oversize piston and the bore. Make sure that all pistons used are of the same oversize.

Piston - to - cylinder wall clearance :
0.02 ~ 0.04 mm (0.0008 ~ 0.0016 in.)

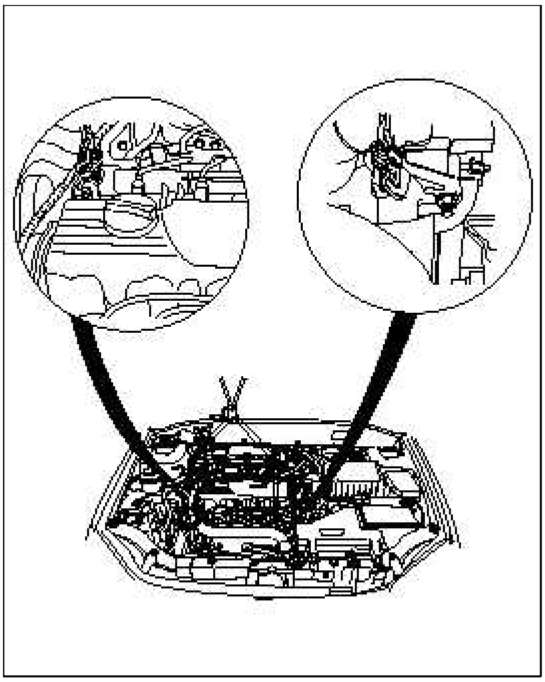
Engine Mechanical System > Cylinder Block > Engine Mounts > Components and Components Location

COMPONENTS

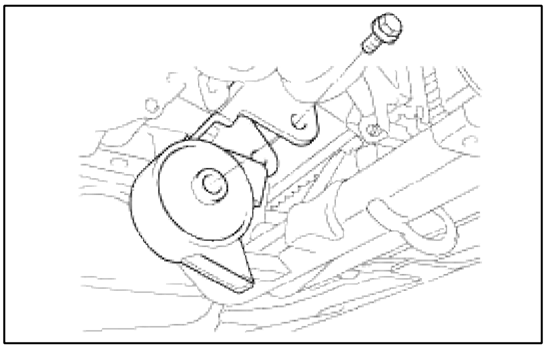

Vehicle with a manual transaxle
Transaxle mount bracket
90-110 (900-1100, 66-81)
30-40 (300-400, 22-30)
Cap
Front side member (L.H.)
Vehicle with an automatic transaxle
Transaxle mount bracket
90-110 (900-1100, 66-81)
30-40 (300-400, 22-30)
Cap
Front side member (L.H.)
50~65 (500~650, 37~48)
90~110 (900~1100, 66~81)
30~40 (300~400, 22~30)
90 ~ 110 (900 ~ 1100, 66 ~ 81)
Transaxle mount bracket
45~60 (450~600, 33~44)
Engine mount bracket
45~60 (450~600, 33~44)
30 ~ 40 (300 ~ 400, 22 ~ 30)
Rear roll stopper
30~40 (300~400, 22~30)
Front roll stopper
Sub - frame
TORQUE : Nm (kg.cm, lb.ft)

Engine Mechanical System > Cylinder Block > Engine Mounts > Repair procedures

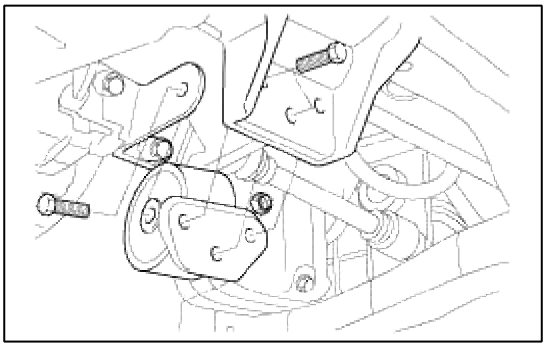
REMOVAL



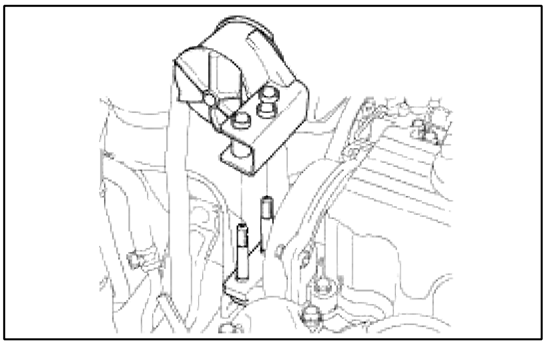
1. Remove the front roll stopper bracket from the sub-frame. (14 mm bolt and nut, 17 mm bolt.)



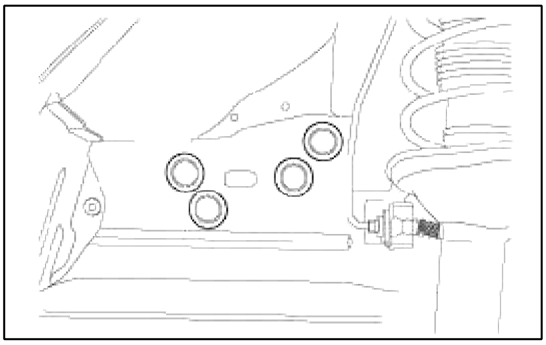
2. Remove the rear roll stopper bracket from the sub-frame.



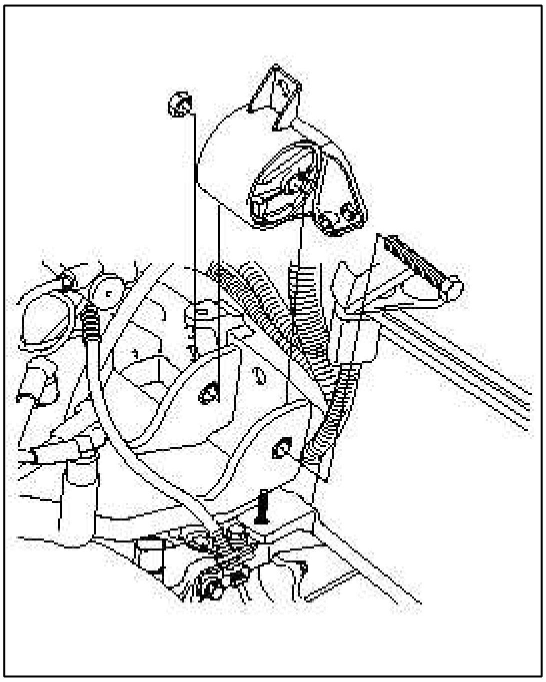
3. Engine
   (1) Remove the engine mount bracket from the engine. (14 mm, 17 mm)
   (2) Remove the engine mount insulator.



4. Transaxle
   (1) Remove the transaxle mount bolt. (17 mm)
   (2) Detach the cap from inside the right fender shield. Remove the transaxle mount bolts.

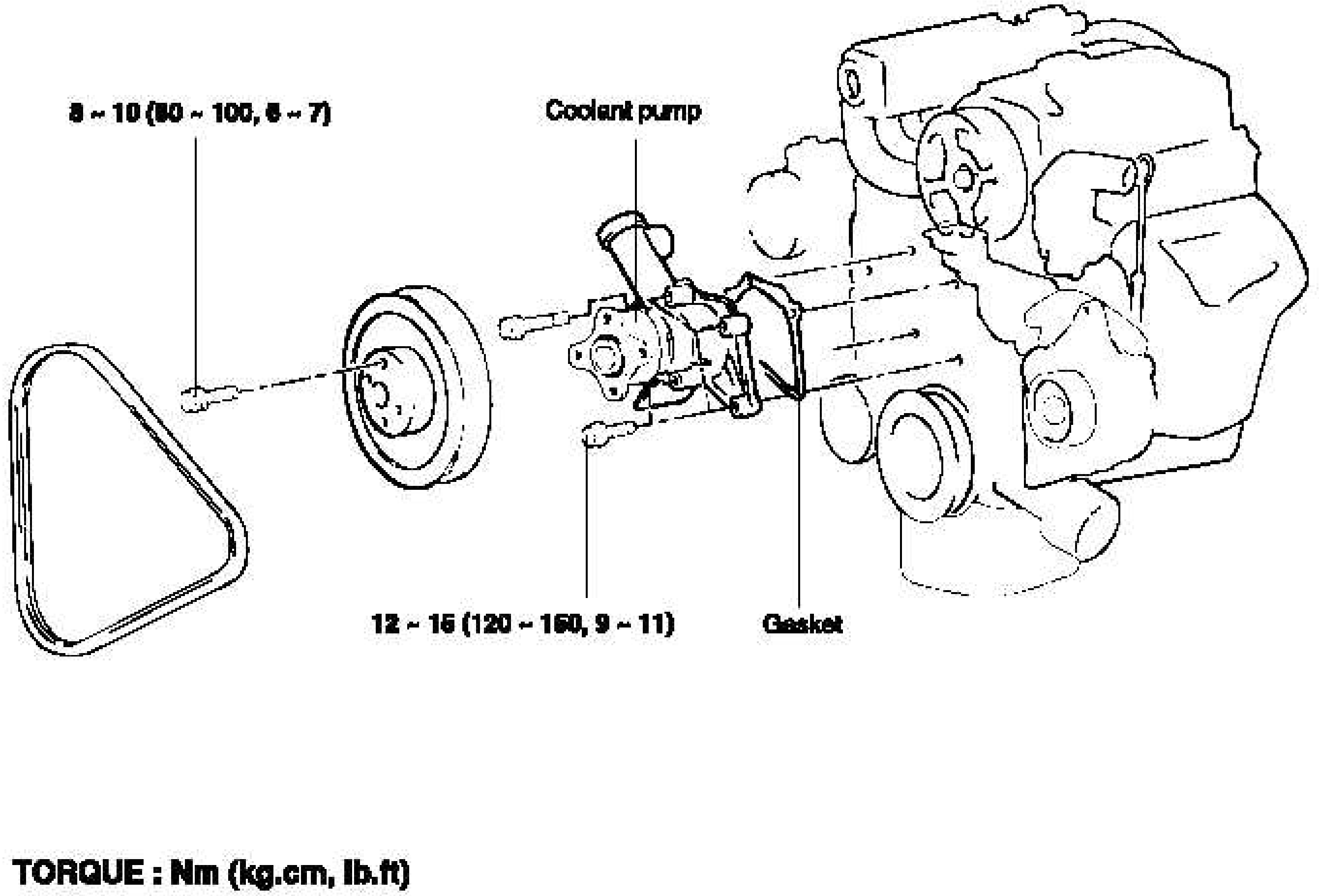


   (3) Remove the transaxle mount bracket.



Engine Mechanical System > Cooling System > Water pump > Components and Components Location

COMPONENTS



Engine Mechanical System > Cooling System > Water pump > Repair procedures

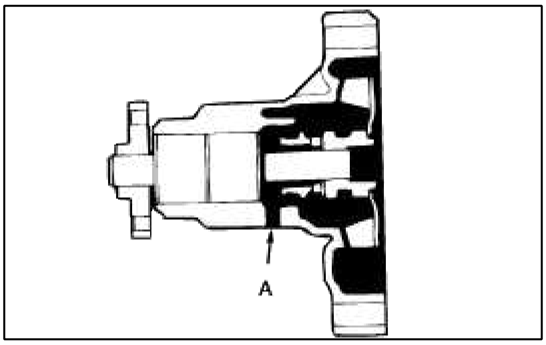
DISASSEMBLY

1. Drain the coolant and disconnect the coolant outlet pipe connection hose from the coolant pump.
2. Remove the drive belt and engine coolant pump pulley.
3. Remove the timing belt covers and the timing belt idler.
4. Remove the coolant pump mounting bolts, then remove the generator brace.
5. Remove the coolant pump assembly from the cylinder block.

INSPECTION

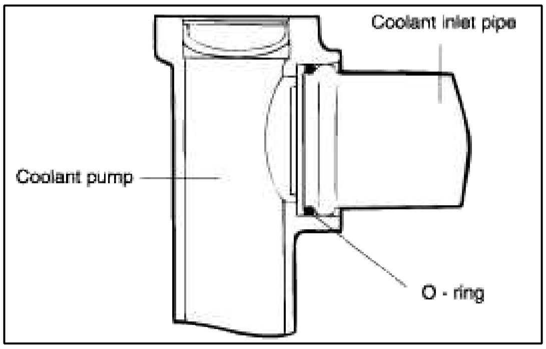
1. Check each part for cracks, damage or wear, and replace the coolant pump assembly if necessary.
2. Check the bearing for damage, abnormal noise and sluggish rotation. Replace the coolant pump assembly if necessary.

3. Check for coolant leakage. If coolant leaks form hole "A", the seal is defective. Replace the coolant pump assembly.



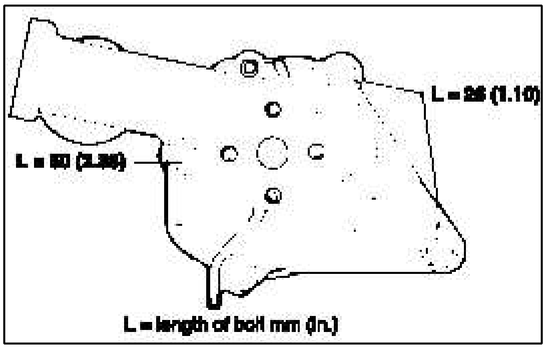
REASSDEMBLY

1. Clean the gasket surfaces of the coolant pump body and the cylinder block.



2. Install a new coolant pump gasket to the coolant pump and tighten the bolts to the specified torque.

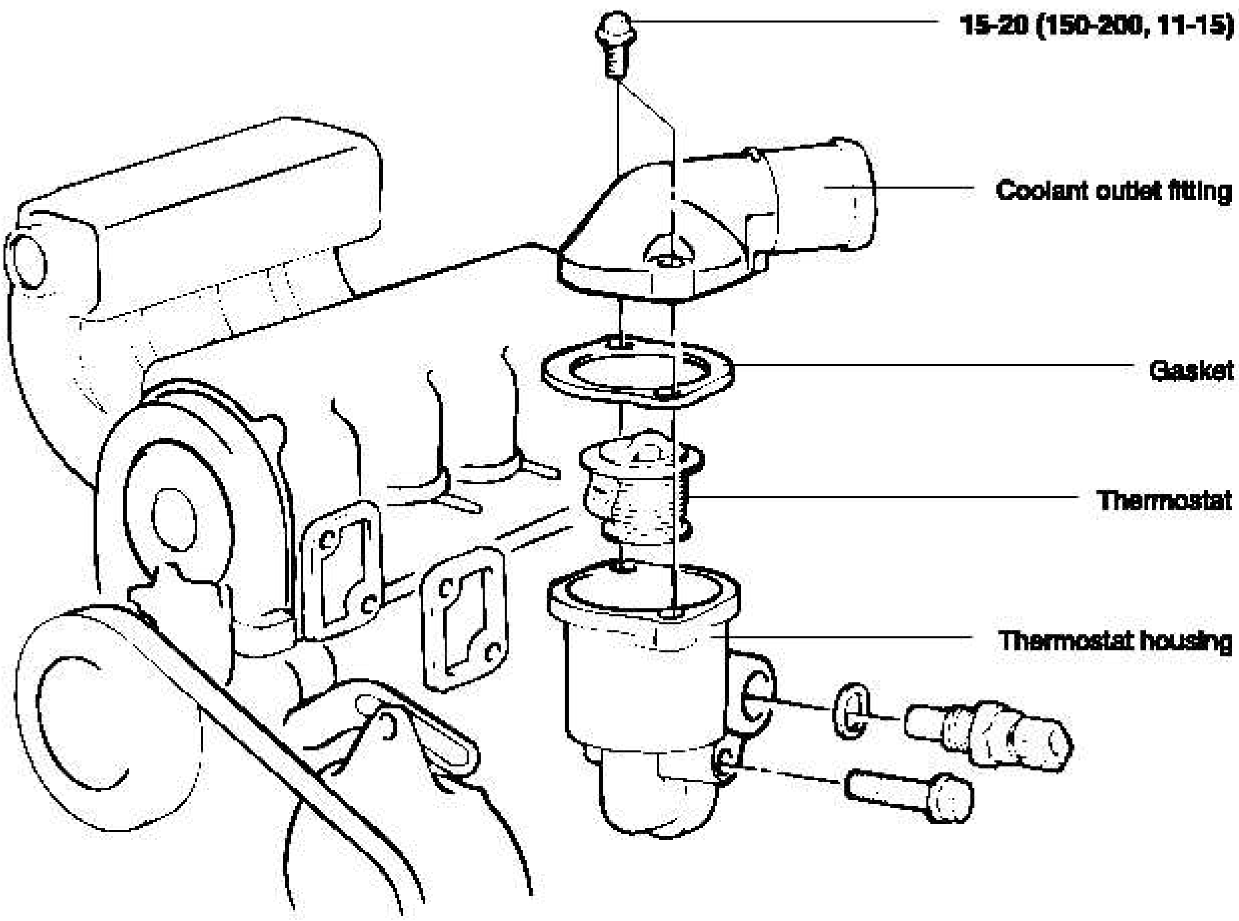
Tightening torque
Coolant pump bolt to cylinder block :
12 ~ 15 Nm (120 ~ 150 kg.cm, 9 ~ 11 lb.ft)



3. Install the timing belt idler and timing belt. Adjust the timing belt tension. Refer to the "Timing System" section.
4. Install the timing belt covers.
5. Install the coolant pump pulley, drive belt and adjust the belt tension.
6. Refill the system with clean coolant.
7. Run the engine and check for leaks.

Engine Mechanical System > Cooling System > Thermostat > Components and Components Location

COMPONENTS


15-20 (150-200, 11-15)
Coolant outlet fitting
Gasket
Thermostat
Thermostat housing

TORQUE : Nm (kg.cm, lb.ft)

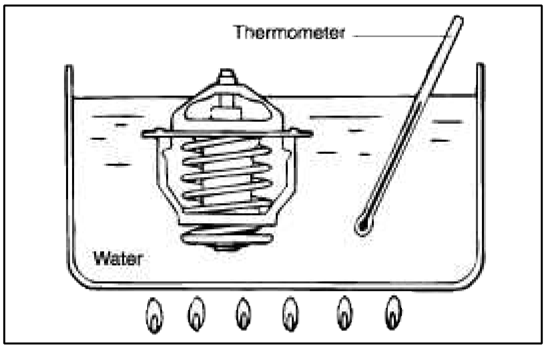
Engine Mechanical System > Cooling System > Thermostat > Repair procedures

INSPECTION

1. Drain the coolant down to thermostat level or below.
2. Remove the coolant outlet fitting and gasket.
3. Remove the thrmostat.

4. Immerse the thermostat in hot coolant to check proper valve opening temperature. Replace if necessary.

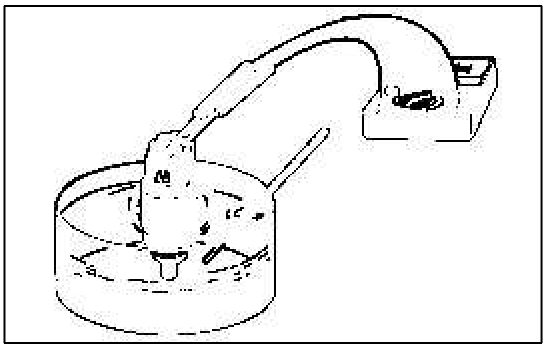
Valve opening temperature : 82° C (177° F)
Full opening temperature : 95° C (205 °F)
Valve lift (at full open) : 8.5 mm (0.33 in.) or more



COOLANT TEMPERATURE SENDER

1. Heat the engine coolant temperature sender by submerging it in hot water.
2. Check that the resistance is within the specified range.

Resistance : 123.8 ~ 172.8 Ω at 60°C (140°F)
23.5 ~ 29.5 Ω at 115°C (239°F)



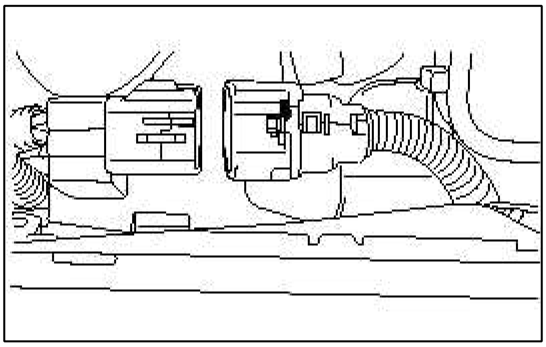
REASSEMBLY

1. Verify the flange of the thermostat is correctly seated in the socket of the thermostat housing. If the thermostat is installed in the wrong direction, the bottom of the thermostat will thuch the rib inside the intake manifold, making it impossible for the thermostat to operate properly.
2. Install a new gasket and the coolant outlet fitting.
3. Refill the system with clean coolant.

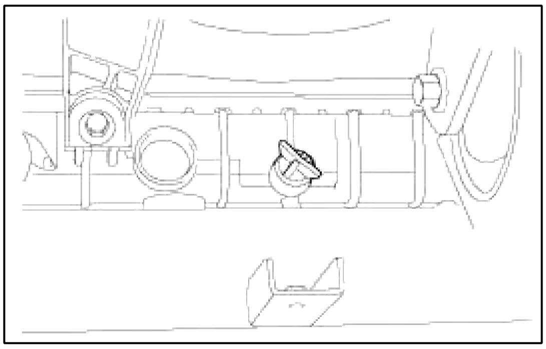
Engine Mechanical System > Cooling System > Radiator > Repair procedures

DISASSEMBLY

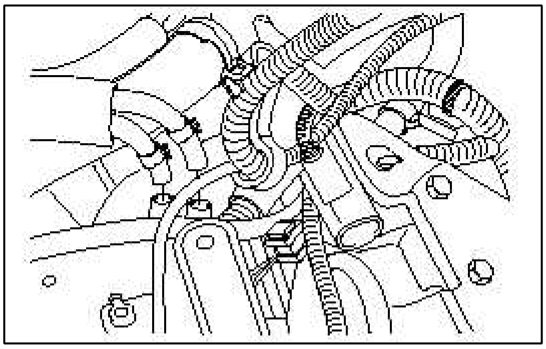
1. Disconnect the radiator fan motor connector.



2. Set the temperature of the heater control to the hot position.
3. Loosen the radiator drain plug to drain coolant.



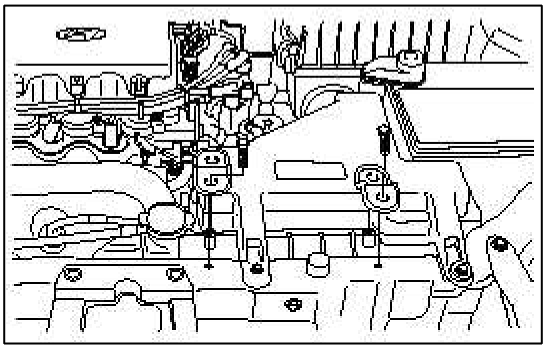
4. Disconnect the upper and lower hose and overflow tube.
5. For vehicles with automatic transaxles, disconnect the oil cooler hoses from the automatic transaxle.



CAUTION

Plug the ends of the oil cooler hoses and the automatic transaxle fittings to prevent transaxle fluid form spilling out and foreign material from entering.

6. Remove the radiator mounting bolts.



7. Remove the radiator together with the fan motor.
8. Remove the fan motor from the radiator.

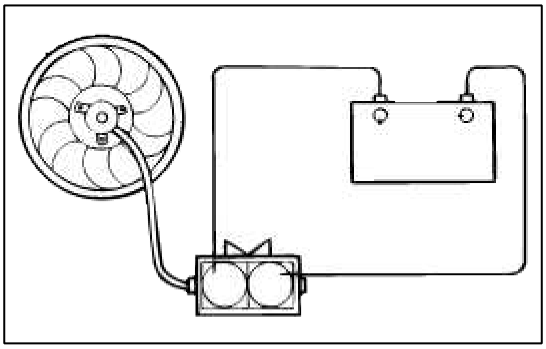
INSPECTION

1. Check the radiator for bent, broken or plugged fins.

2. Check the radiator for corrosion, damage, rust or scale.
3. Check the radiator hoses for cracks, damage or deterioration.
4. Check the reservoir tank for damage.
5. Check the radiator cap spring for damage.
6. Test the pressure of the cap using a cooling system checker
7. Check the radiator cap seal for cracks or damage.

RADIATOR FAN MOTOR

1. Check that the radiator fan rotates when battery voltage is applied to the terminals (as shown in figure).



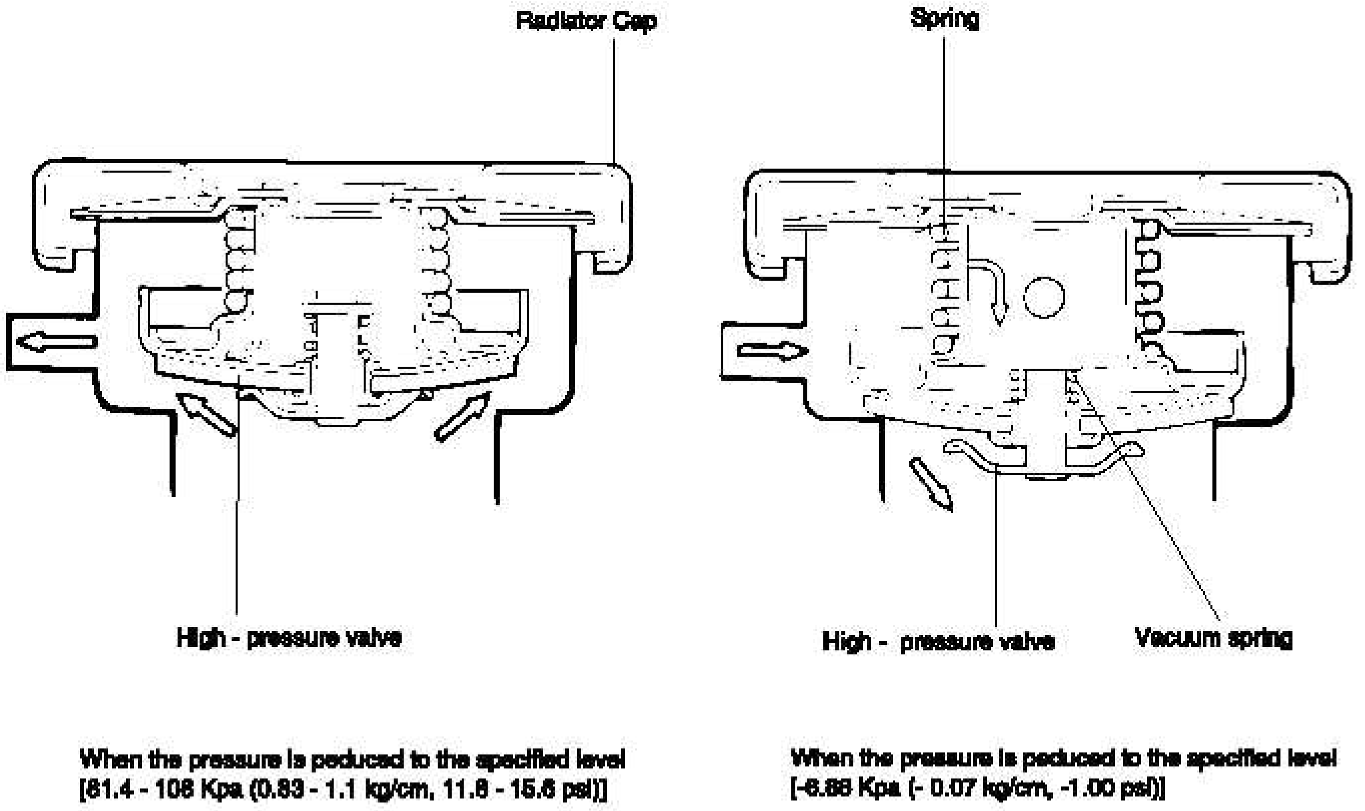
2. Check that abnormal noises are not produced while the motor is turning.

REASSEMBLY

1. Fill the radiator and reservoir tank with clean coolant mixture.
2. Run the engine until the thermostat opens, and then stop the engine.
3. Remove the radiator cap, and add coolant up to the filler neck of the radiator, and then fill the reservoir tank to the upper level.
4. Check that there is no leakage from the radiator, hoses or connections.

Engine Mechanical System > Cooling System > Radiator Cap > Components and Components Location

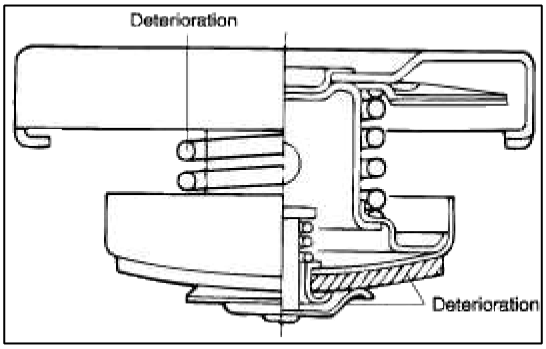
COMPONENTS


Radiator Cap
Spring
High - pressure valve
High - pressure valve
Vacuum spring
When the pressure is peduced to the specified level
[81.4 - 108 Kpa (0.83 - 1.1 kg/cm, 11.8 - 15.6 psi)]
When the pressure is peduced to the specified level
[-6.86 Kpa (- 0.07 kg/cm, -1.00 psi)]

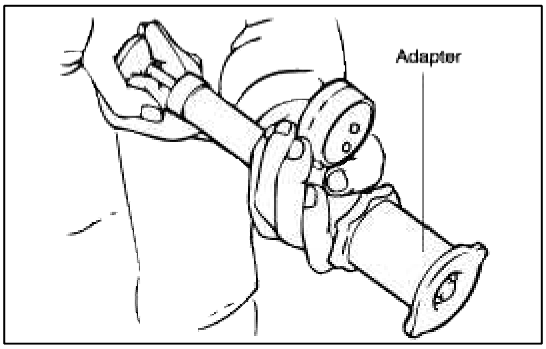
Engine Mechanical System > Cooling System > Radiator Cap > Repair procedures

INSPECTION

1. Check the radiator cap for damage, cracks and deterioration.

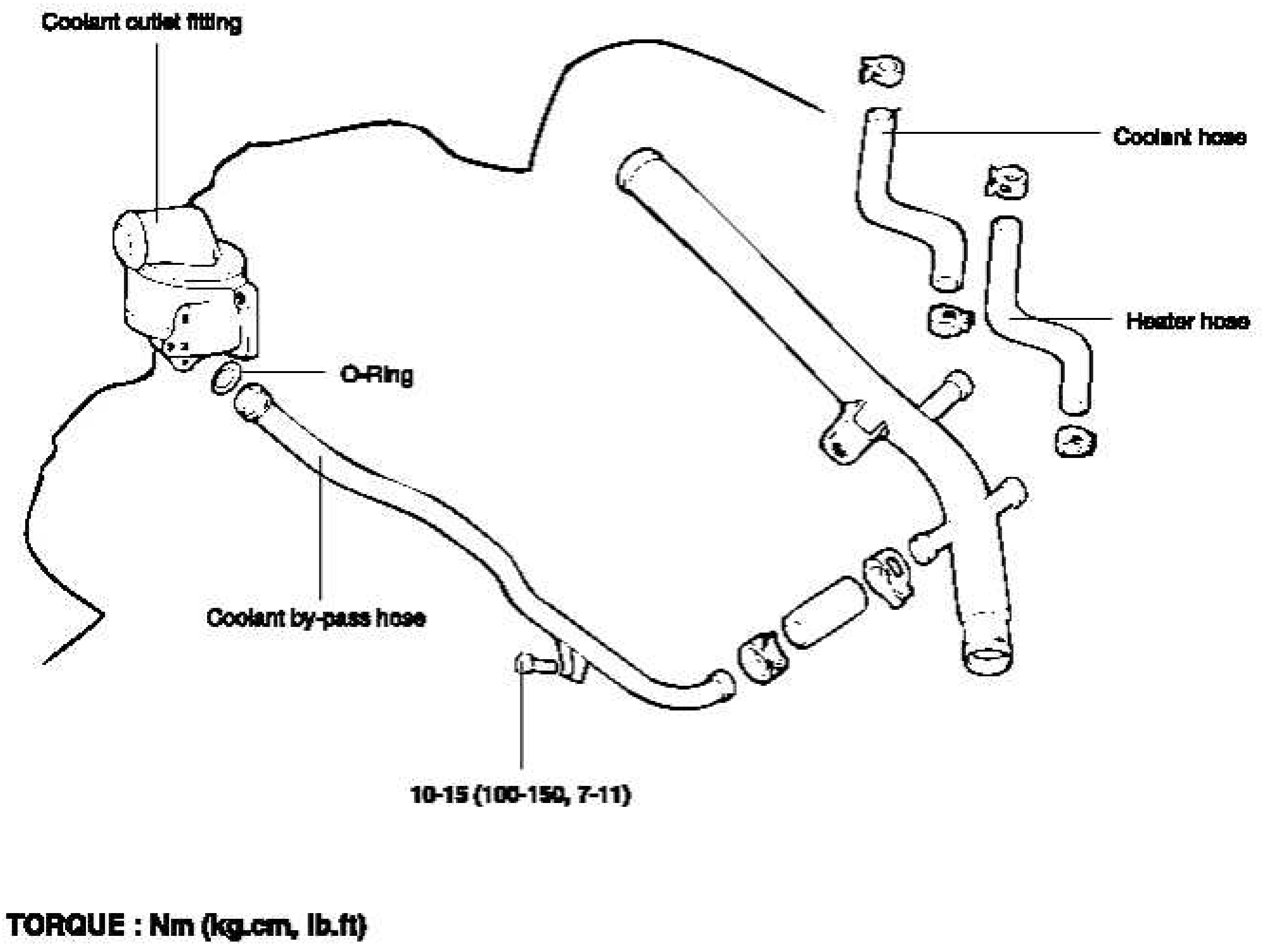

Deterioration
Deterioration

2. Attach a radiator cap tester to the radiator.
3. Pump the tester until the pointer stabilizes.
4. If the pointer stays constant for 10 seconds at a pioint exceeding the service limit, the radiator cap is good.



Engine Mechanical System > Cooling System > Engine Coolant Hose / Pipes > Components and Components Location

COMPONENTS


Coolant outlet fitting
Coolant hose
Heater hose
O-Ring
Coolant by-pass hose
10-15 (100-150, 7-11)
TORQUE : Nm (kg.cm, lb.ft)

Engine Mechanical System > Cooling System > Engine Coolant Hose / Pipes > Repair procedures

INSPECTION

1. Check the coolant pipes and hoses for cracks, damage, or restrictions.
2. Replace if necessary.

REASSEMBLY

1. Fit the O - ring in the groove provided at the coolant inlet pipe end, wet the O-ring with coolant and insert into the coolant inlet pipe.

2. Make sure that there is a yellow mark on the inlet coolant hose and while keeping the yellow mark toward of the coolant inlet pipe, fit the hose to the pipe to the end of the yellow mark.

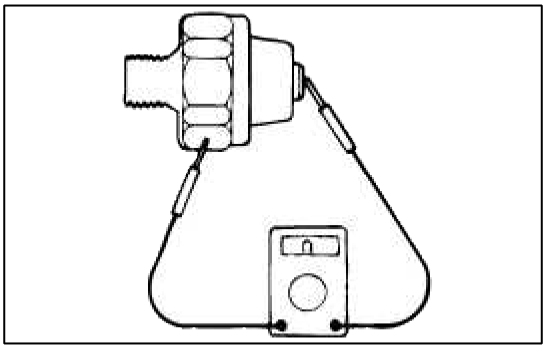
NOTE

1. Do not apply oil or grease to the coolant pipe O-ring
2. Keep the coolant pipe connections free of sand, dust, etc.
3. Insert the coolant pipe fully into the coolant pump.
4. Do not reuse the O-ring, replace it with a new one.

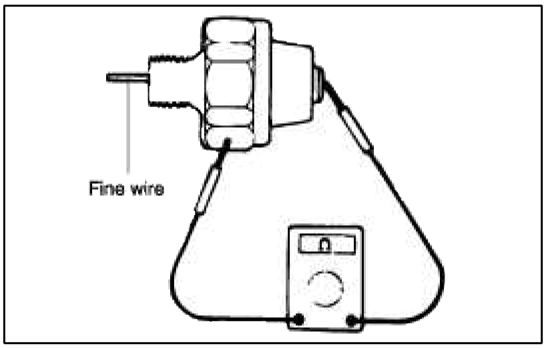
Engine Mechanical System > Lubrication System > Oil Pump > Description and Operation

OIL PRESSURE SWITCH

1. Check the continuity between the terminal and the body with an ohmmeter.

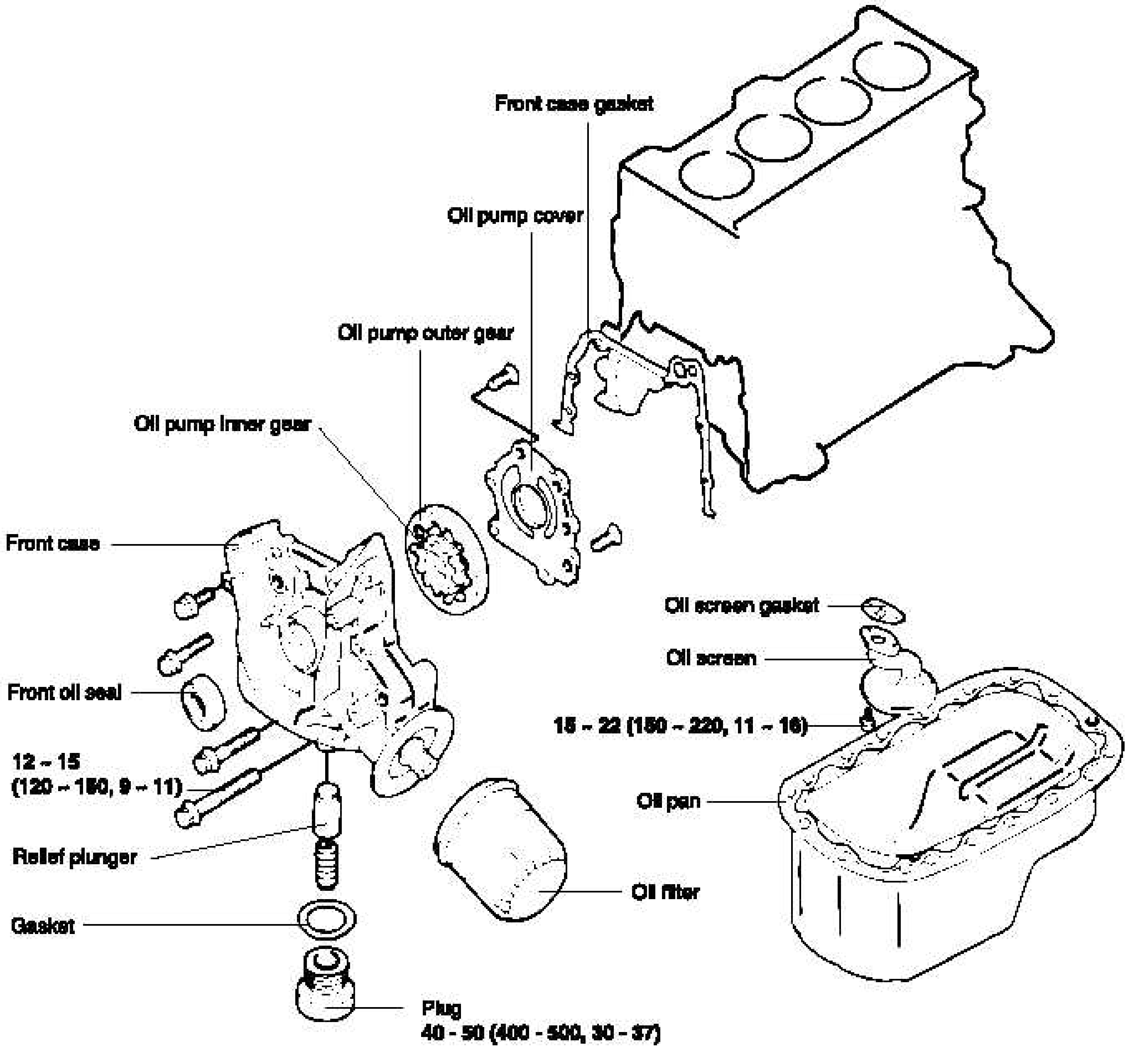


2. Check the continuity between the terminal and the body when the fine wedge is pushed. If there is continuity enve when the fine wedgew is pushed, replace it.
3. However, if there is non continuity when a 50 Kpa (70 psi) vacuum is applied through the oil hole, the switch is operating properly. Check to see that air doesn't leak. If air leaks, the diaphragm is broken. Replace the switch.



Engine Mechanical System > Lubrication System > Oil Pump > Components and Components Location

COMPONENTS


Front case gasket
Oil pump cover
Oil pump outer gear
Oil pump inner gear
Front case
Oil screen gasket
Oil screen
Front oil seal
15 ~ 22 (150 ~ 220, 11 ~ 16)
12 ~ 15
(120 ~ 150, 9 ~ 11)
Oil pan
Relief plunger
Oil filter
Gasket
Plug
40 - 50 (400 - 500, 30 - 37)

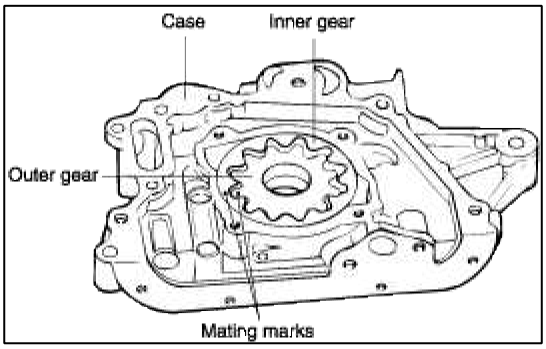
TORQUE : Nm (kg.cm, lb.ft)

Engine Mechanical System > Lubrication System > Oil Pump > Repair procedures

DISASSEMBLY

1. Remove the timing belt. Refer to the "Timing Belt" section.
2. Remove all the oil pan bolts.
3. Remove the oil pan.
4. Remove the oil screen.
5. Remove the front case assembly.
6. Remove the oil pump cover.

7. Remove the inner and outer gears from the front case. The mating marks on the inner and outer gears indicate the direction of installation. Make sure that the inner and outer gears are installed as shown.



8. Remove the plug and remove the relief spring and relief plunger.

INSPECTION

OIL PAN AND OIL SCREEN

1. Check the oil pan for failure, damage or cracks. Replace of defective.
2. Check the oil screen for failure, damage and cracks and replace of defective.

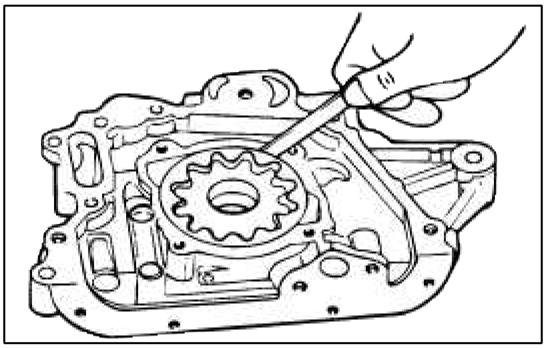
FRONT CASE AND OIL PUMP COVER

Check for worn (especially stepped) or damaged surfaces contacting gears.

OIL PUMP GEARS

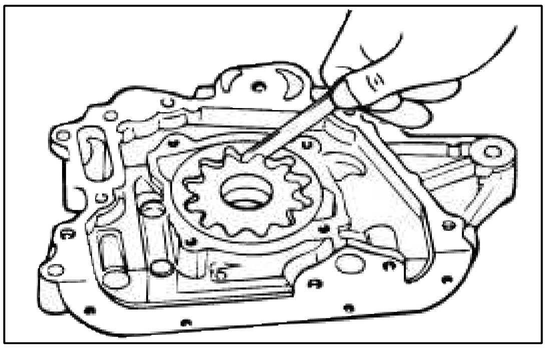
1. Check for worn or damaged gear teeth surfaces.
2. Check for clearance between outer gear and front case.

Outer gear
Clearance between outer circumference and front case :
0.12 ~ 0.18 mm (0.005 ~ 0.007 in.)



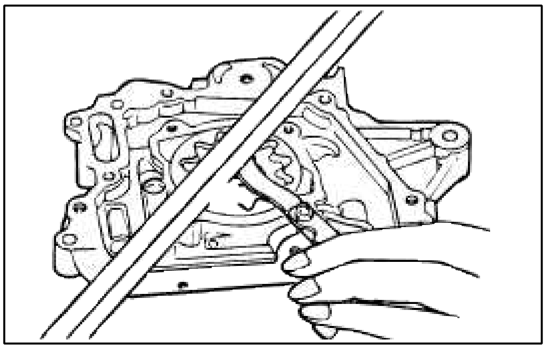
3. Check the tip clearance on the pump rotor.

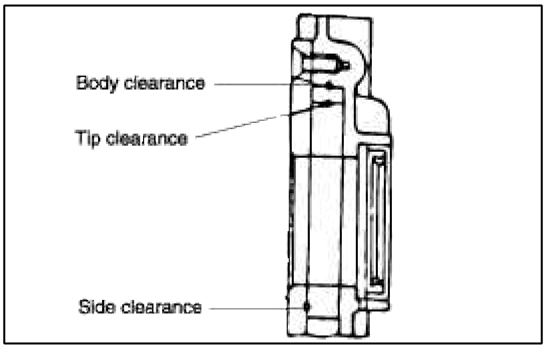
Standard value :
0.025 ~ 0.069 mm (0.001 ~ 0.003 in.)



4. Check the axial clearance on the outer pump roter.

Standard value :
0.04 ~ 0.087 mm (0.0016 ~ 0.0034 in.)

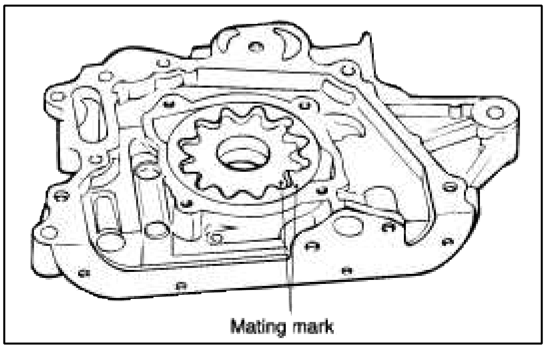




REASSEMBLY

OIL PUMP

1. Install the outer and inner gears into the front case.
   Make sure that the inner and outer gears are installed in the same direction as shown.



2. Install the oil pump cover and tighten the bolts to the specified torque. Atfer the bolts have been tithtened, check to ensure that the gear turns smoothly.

Tightening torque
Oil pump cover bolt :
8 ~ 12 Nm (80 ~ 120 kg.cm, 6 ~ 8.8 lb.ft)

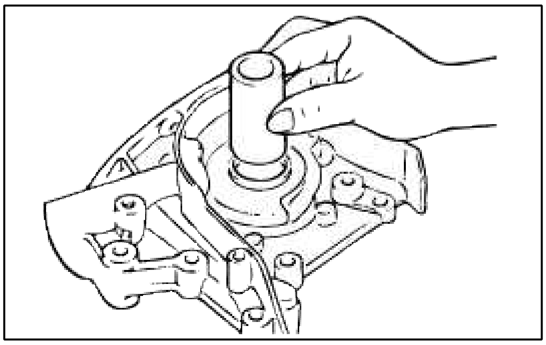
---

3. Install the relief valve and spring. Tighten the plug to the specified torque. Apply engine oil to the relief valve.

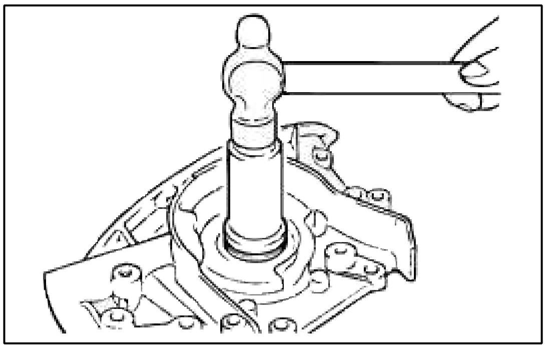
Tightening torque
Relief valve plug :
40 ~ 50 Nm (400 ~ 500 kg.cm, 30 ~ 37 lb.ft)

OIL SEAL

1. Inspect for worn, distorted or damaged lips.
2. Check for elongated spring ring.
3. Install the Special Tool, Crankshaft Front Oil Seal Guide (09231 - 22100), to the front end of the crankshaft. Apply engine oil to the outer surface of the oil seal guide, and install the new oil seal along the guide by hand, until it touches front case. Always use a new oil seal when reassembling.



4. Use the Special Tool, Crankshaft Front Oil Seal Installer (09231 - 22000), to install the oil seal.



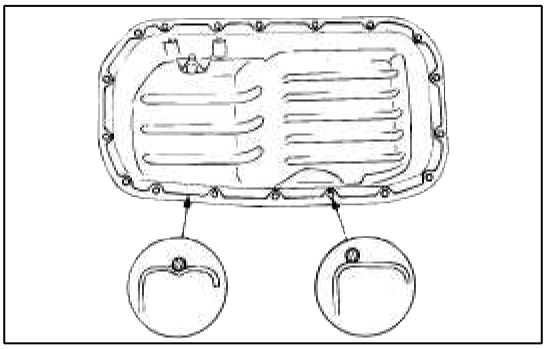
5. Install the crankshaft sprocket, timing belt and crankshaft pulley. Refer to the "Timing Belt" section.
6. Install the oil screen.
7. Clean both gasket surfaces of the oil pan and the cylinder bolck.
8. Apply sealant into the groove of the oil pan flange as shown.

> **CAUTION**
>
> 1. Apply sealant approx. 4 mm (0.16 in.) in thickness.
> 2. After application of sealant, do not exceed 15 minutes before installing the oil pan.

9. Install the oil pan and tighten the bolts to the specified torque.

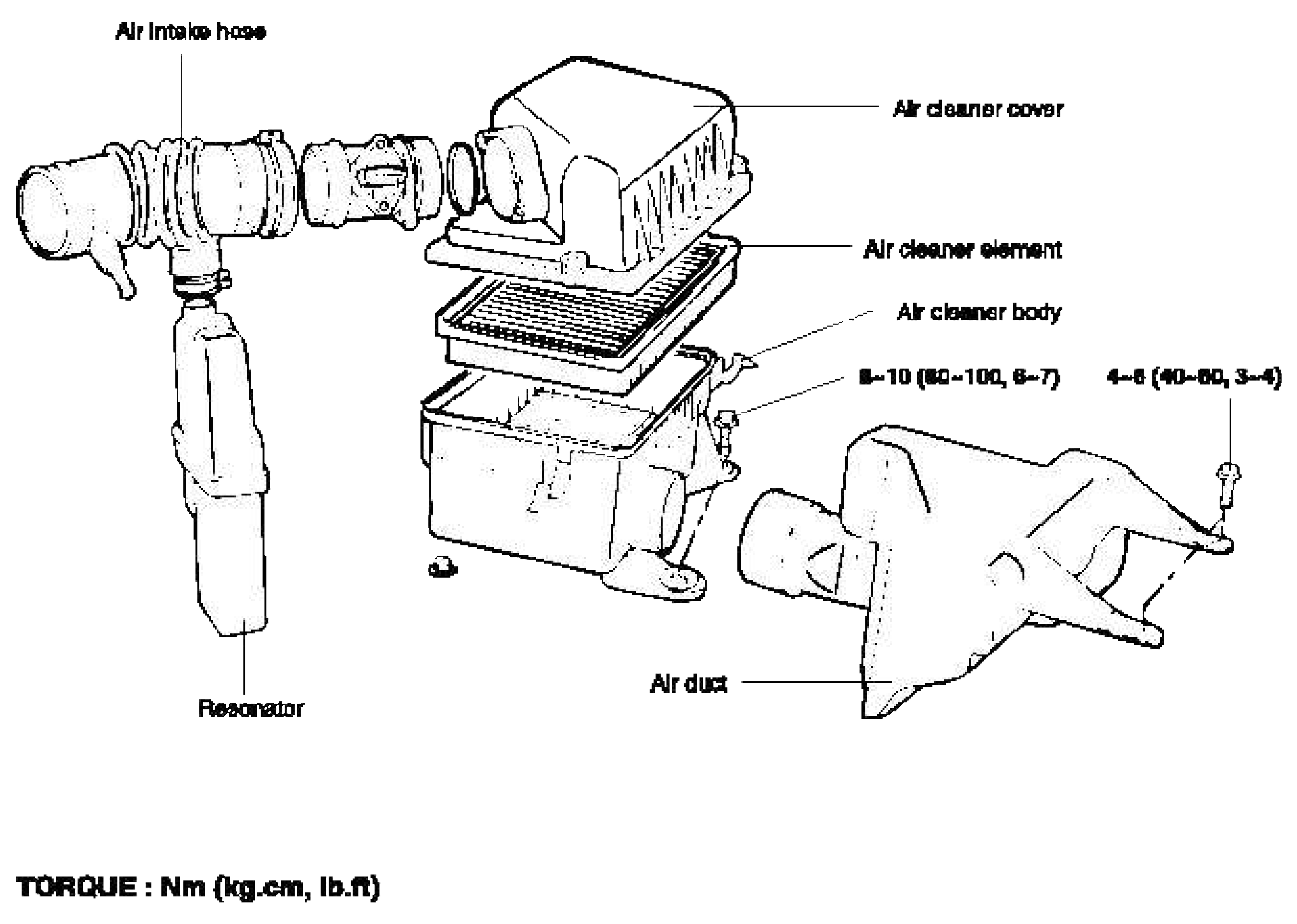
Tightening torque

Oil pan bolt : 6 ~ 8 Nm (60 ~80 kg.cm, 4 ~ 6 lb.ft)



Engine Mechanical System > Intake And Exhaust System > Air Cleaner > Components and Components Location

COMPONENTS

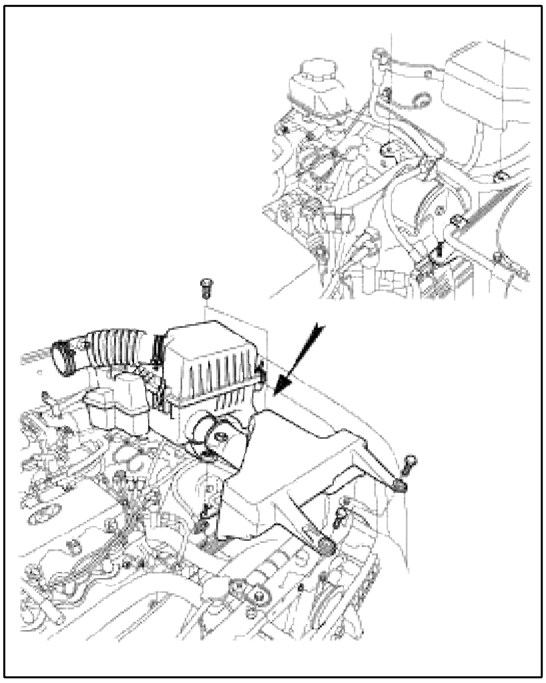

Air intake hose
Air cleaner cover
Air cleaner element
Air cleaner body
8~10 (80~100, 6~7)
4~6 (40~60, 3~4)
Resonator
Air duct
TORQUE : Nm (kg.cm, lb.ft)

Engine Mechanical System > Intake And Exhaust System > Air Cleaner > Repair procedures

REMOVAL

1. Remove the air duct connected to the air cleaner.
2. Remove the air intake hose from the air cleaner side.
3. Remove the air cleaner cover and filter.

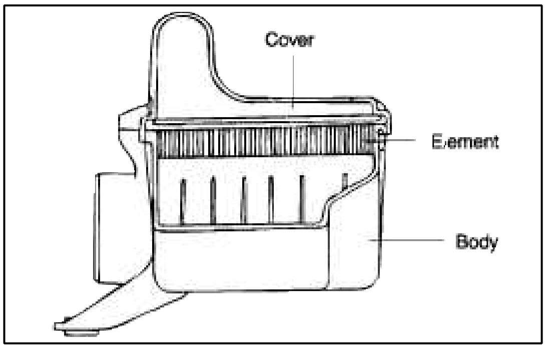
4. Remove the air cleaner mounting bolts and remove the air cleaner.



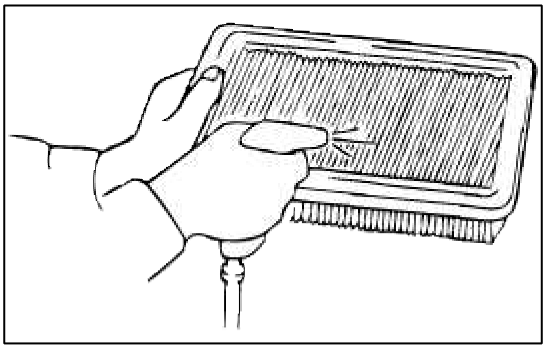
INSTALLATION

INSPECTION

1. Check the air cleaner body, cover, and filter for distortion, corrosion or damage.

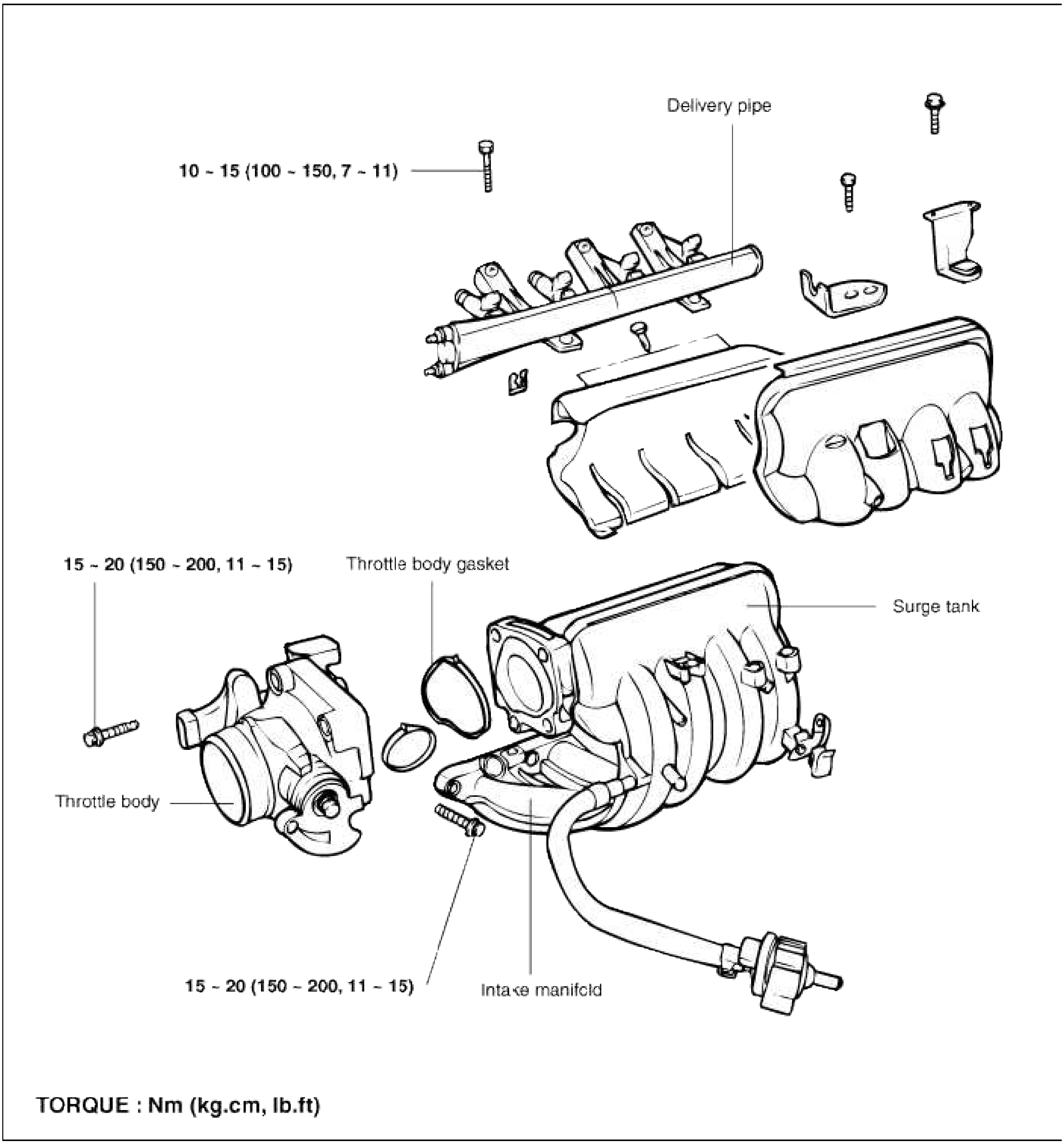


2. Check the air duct for damage.
3. Check the resonator for distortion or damage.
4. Check the air cleaner filter for restrictions, contamination or damage.
   If the filter is slightly restricted, remove dust and other contaminants by blowing air from the upper side through the filter.
5. Check the air cleaner housing for restrictions, contamination or damage.



Engine Mechanical System > Intake And Exhaust System > Intake Manifold > Components and Components Location

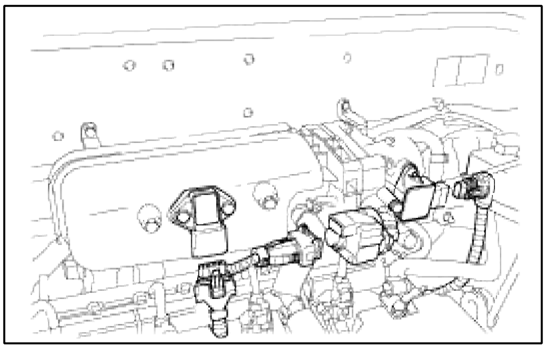
COMPONENTS


Delivery pipe
10 ~ 15 (100 ~ 150, 7 ~ 11)
15 ~ 20 (150 ~ 200, 11 ~ 15)
Throttle body gasket
Surge tank
Throttle body
15 ~ 20 (150 ~ 200, 11 ~ 15)
Intake manifold
TORQUE : Nm (kg.cm, lb.ft)

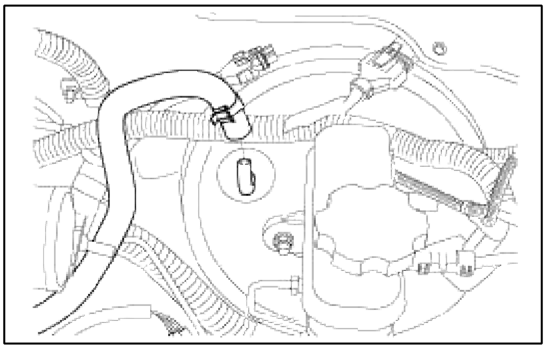
Engine Mechanical System > Intake And Exhaust System > Intake Manifold > Repair procedures

REMOVAL

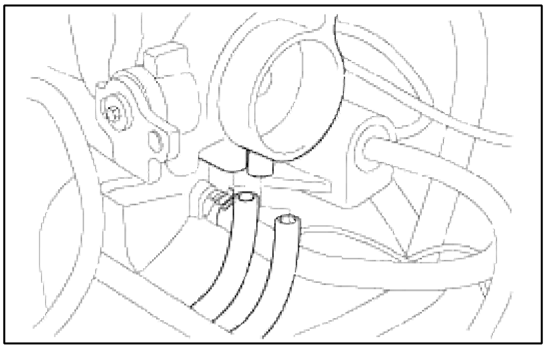
1. Disconnect the ISA, TPS and MAP sensor.



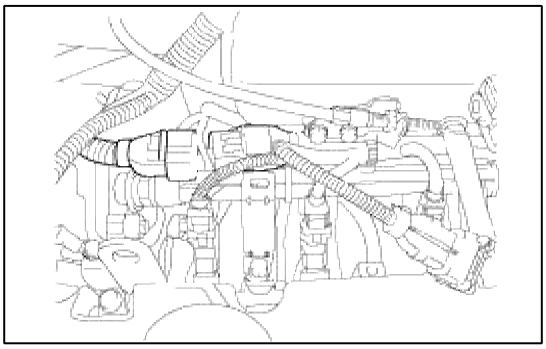
2. Remove the intake air hose connected to the throttle body.
3. Remove the accelerator cable.
4. Remove the P.C.V. hose and brake booster vacuum hose.



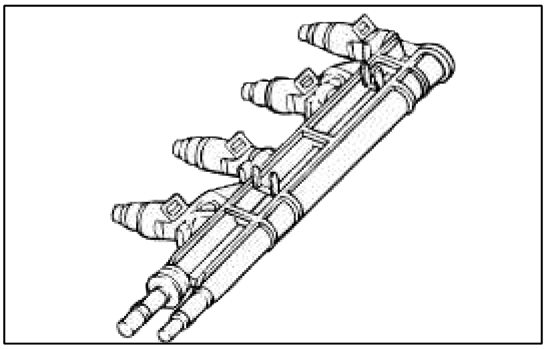
5. Remove the coolant hose connections from the throttle body.



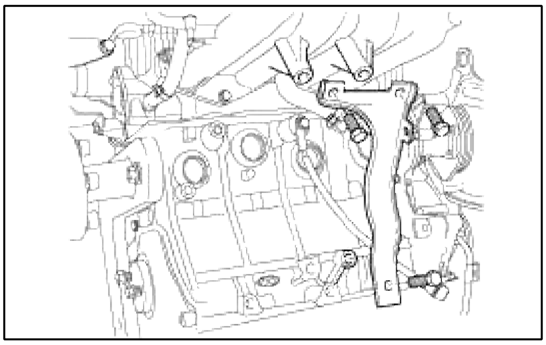
6. Disconnect the fuel injector harness connector.



7. Remove the delivery pipe and fuel injectors from the intake manifold.



8. Remove the surge tank stay.



9. Remove the intake manifold.

INSTALLATION

1. Install the delivery pipe with the fuel injectors attached.

> **CAUTION**
>
> Be careful not to drop the injectors when removing the delivery pipe.

2. Ensure that insulators are correctly inserted into the delivery pipe hole.

INSPECTION

SURGE TANK

Check the surge tank for defects or cracks.

Replace if necessary.

INTAKE MANIFOLD

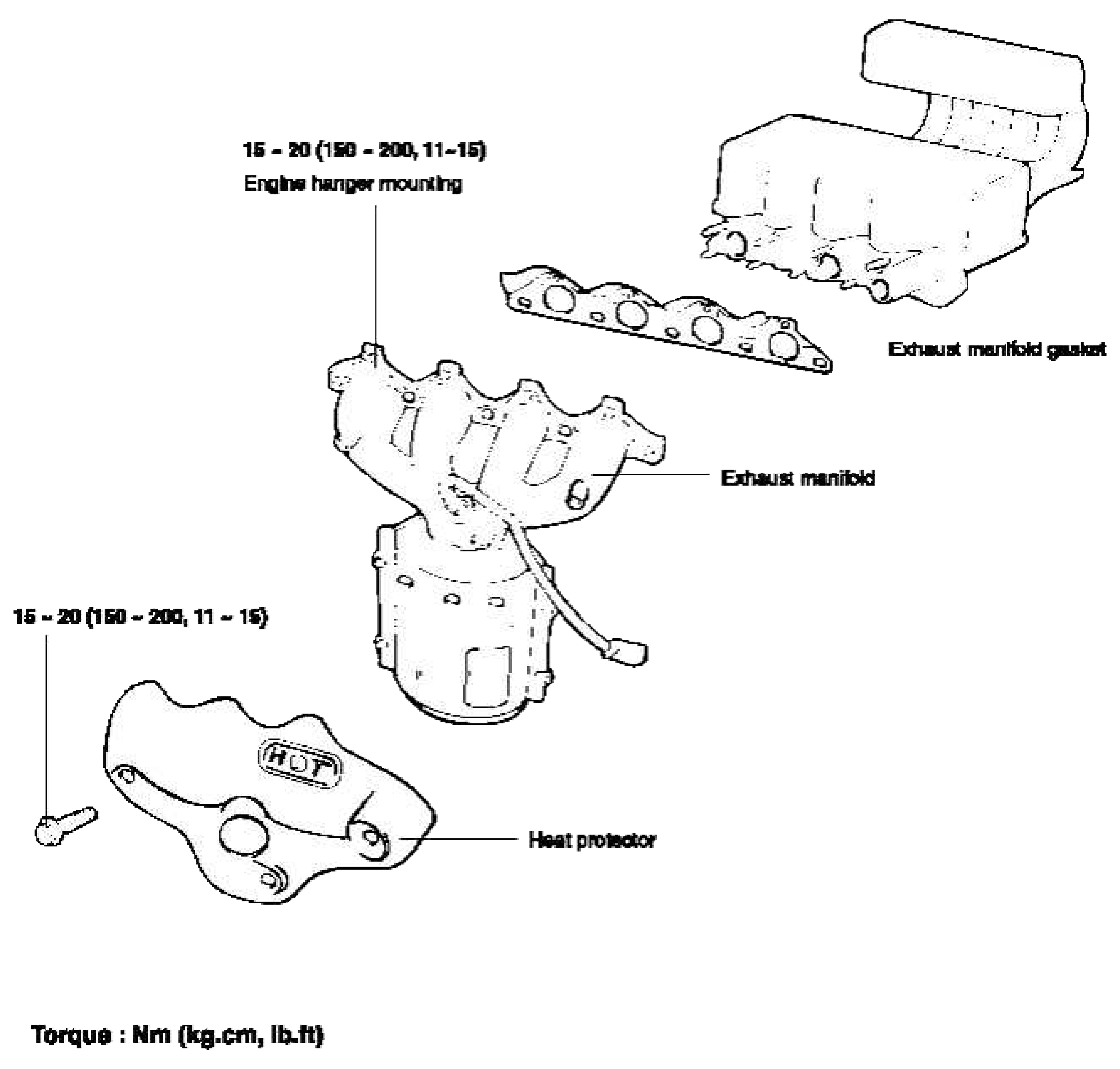
Check for damage or cracking of any part.

AIR HOSE

Check for damage or cracking of any part.

Engine Mechanical System > Intake And Exhaust System > Exhaust Manifold > Components and Components Location

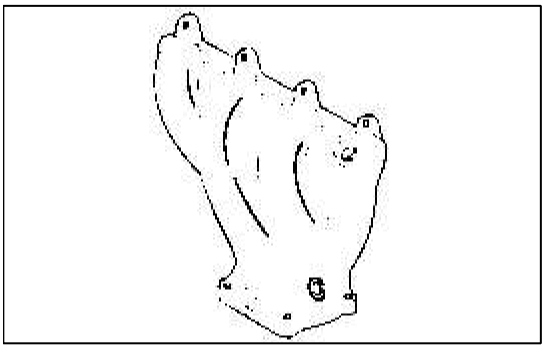
COMPONENTS


15 ~ 20 (150 ~ 200, 11~15)
Engine hanger mounting
Exhaust manifold gasket
Exhaust manifold
15 ~ 20 (150 ~ 200, 11 ~ 15)
HOT
Heat protector
Torque : Nm (kg.cm, lb.ft)

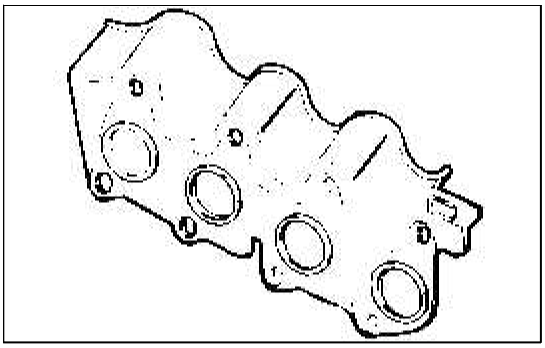
Engine Mechanical System > Intake And Exhaust System > Exhaust Manifold > Repair procedures

INSPECTION

EXHAUST MANIFOLD

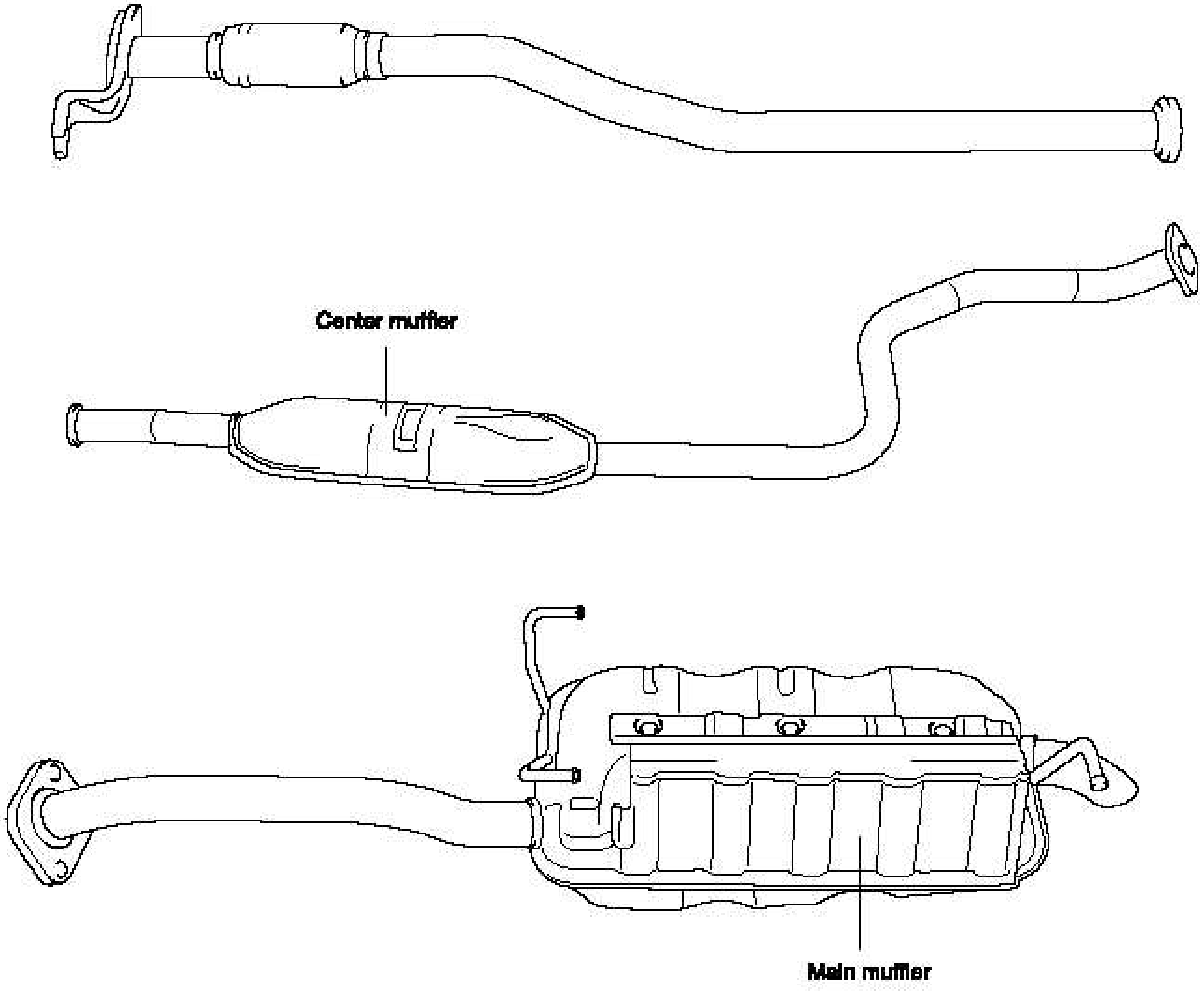


EXHAUST MANIFOLD GASKET



Engine Mechanical System > Intake And Exhaust System > Muffler > Components and Components Location

COMPONENTS


Center muffler
Main muffler

Engine Mechanical System > Intake And Exhaust System > Muffler > Repair procedures

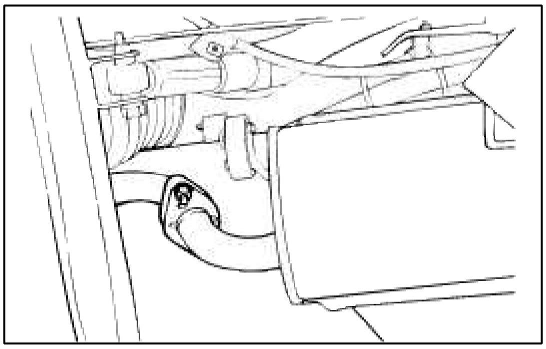
REMOVE

TAIL PIPE

CAUTION

Before removing or inspecting the exhaust system, ensure that it has cooled sufficiently.

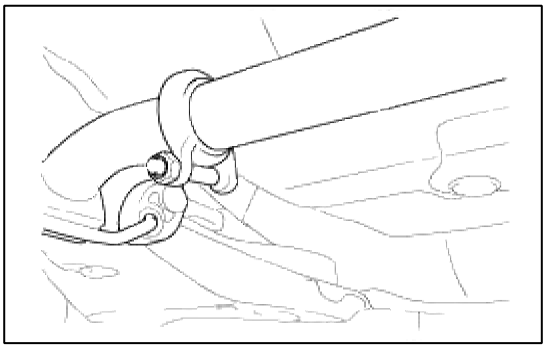
1. Disconnect the tail pipe muffler from the center muffler.



2. Remove the rubber hangers and take out the tail pipe.

CENTER PIPE

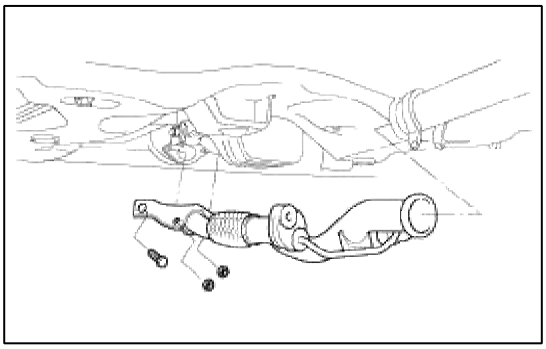
1. Remove the center muffler assembly from the tail pipe.
2. Remove the rubber hanger, then remove the center muffler.



CATALYTIC CONVERTER

FRONT EXHAUST PIPE

1. Remove the front exhaust pipe from the catalytic converter (unleaded vehicle) or exhaust manifold (leaded vehicle).



2. Remove the front exhaust pipe clamp bolt and remove the center muffler mounting nut.

INSTALLATION

1. Install the catalytic converter assembly, front exhaust pipe, center exhaust pipe and the tail pipe. In that specific order.
2. Tighten the parts securely. Make sure there is no interference with any body components.

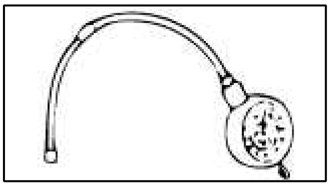
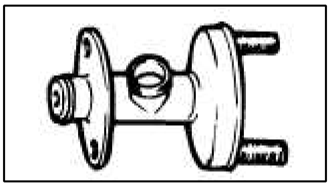
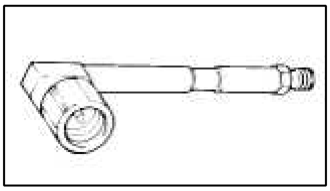
INSPECTION

1. Check the mufflers and pipes for corrosion and damage.
2. Check the rubber hanger and bands for deterioration and cracks.

ACCENT(LC) > 2002 > G 1.5 SOHC > Fuel System

Fuel System > General Information > Special Service Tools

SPECIAL TOOLS

Tool (Number and name)	Illustration	Application
09353-24100 Fuel pressure gauge & hose		Connection of fuel pressure gauge to delivery pipe for measurement of fuel pressure.
09353-38000 Fuel pressure gauge adaptor		
09353-24000 Fuel pressure gauge connector		

Fuel System > General Information > Description and Operation

MFI SYSTEM INSPECTION

1. Engine is hard to start or does not start at all.
2. Unstable idle.
3. Poor driveability.

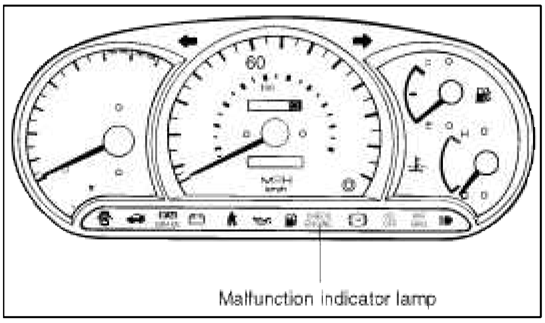
NOTE

- Before removing or installing any part, read the diagnostic trouble codes and then disconnect the battery negative (-) terminal.
- Before disconnecting the cable from battery terminal, turn the ignition switch to OFF. Removal or connection of the battery cable during engine operation or while the ignition switch is ON could cause damage to the ECM.
- The control harnesses between the ECM and heated oxygen sensor are shielded with the shielded ground wires to the body in order to prevent the influence of ignition noises and radio interference. When the shielded wire is faulty, the control harness must be replaced.
- When checking the generator for the charging state, do not disconnect the battery '+' terminal to prevent the ECM from damage due to the voltage.
- When charging the battery with the external charger, disconnect the vehicle side battery terminals to prevent damage to the ECM.

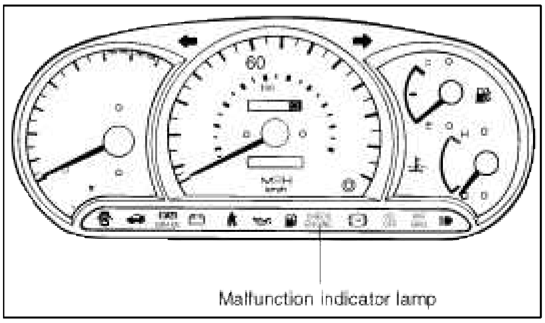
MALFUNCTION INDICATOR LAMP (MIL)

- Catalyst
- Fuel system
- Manifold Absolute Pressure (MAP) Sensor
- Intake Air Temperature Sensor
- Engine Coolant Temperature Sensor

- Throttle Position Sensor
- Upstream Oxygen Sensor
- Downstream Oxygen Sensor Heater
- Downstream Oxygen Sensor
- Upstream Oxygen Sensor Heater
- Injector
- Misfire
- Crankshaft Position Sensor
- Camshaft Position Sensor
- Purge Control Solenoid Valve
- Vehicle Speed Sensor
- Idle Control Valve
- Power Supply
- ECM
- MT/AT Encoding
- Acceleration Sensor
- MIL-on Request Signal
- Power Stage



- Heated oxygen sensor (HO2S)
- Manifold absolute pressure sensor (MAP sensor)
- Throttle position sensor (TP Sensor)
- Engine coolant temperature sensor (ECT Sensor)
- Idle speed control actuator (ISC Actuator)
- Injectors
- ECM



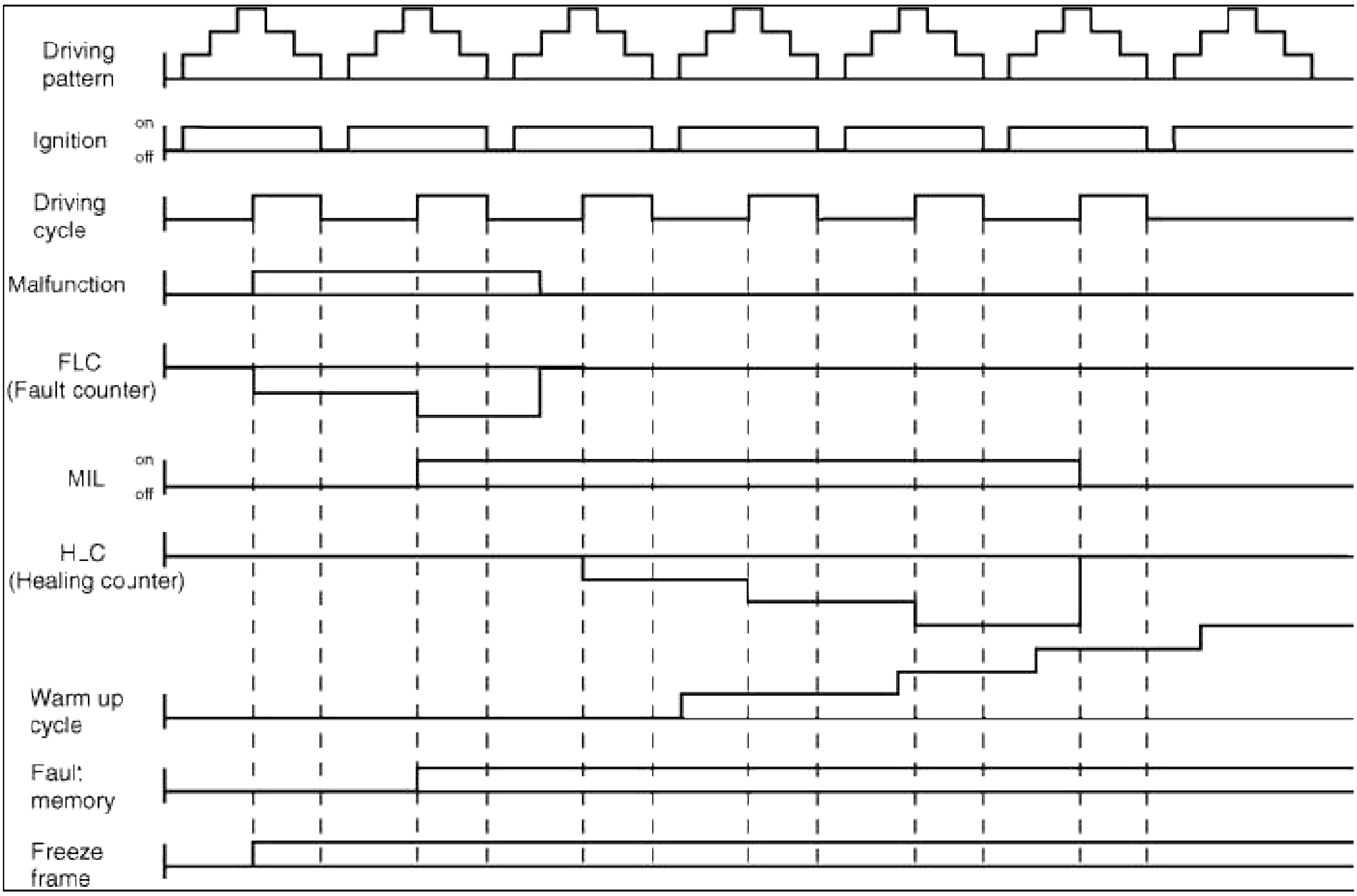
1. After turning ON the ignition key, ensure that the light illuminates for about 5 seconds and then goes out.
2. If the light does not illuminate, check for an open circuit in the harness, a blown fuse or a blown bulb.

SELF-DIAGNOSIS

The ECM monitors the input/output signals (some signals at all times and the others under specified conditions). When the ECM detects an irregularity,it records the diagnostic trouble code, and outputs the signal to the Data Link connector. The diagnosis results can be read with the MIL or HI-SCAN.Diagnostic trouble codes (DTC) will remain in the ECM as long as battery power is maintained. The diagnostic trouble codes will, however, be erased when the battery terminal or the engine control module (ECM) connector is disconnected or by Hi-Scan.

> **NOTE**
>
> If a sensor connector is disconnected with the ignition switch turned on,the diagnostic trouble code (DTC) is recorded. In this case, disconnect the battery negative terminal (-) for 15 seconds or more, and the diagnosis memory will be erased.

THE RELATION BETWEEN DTC AND DRIVING PATTERN



1. When the same malfunction is detected and maintained during two sequential driving cycles, the MIL will automatically illuminate.
2. The MIL will go off automatically if no fault is detected after 3 sequential driving cycles.
3. A Diagnostic Trouble Code(DTC) is recorded in ECM memory when a malfunction is detected after two sequential driving cycles. The MIL will illuminate when the malfunction is detected on the second driving cycle. If a misfire is detected, a DTC will be recorded, and the MIL will illuminate, immediately after a fault is first detected.
4. A diagnostic Trouble Code(DTC) will automatically erase from ECM memory if the same malfunction is not detected for 40 driving cycles.

> **NOTE**
>
> - A "warm-up cycle" means sufficient vehicle operation such that the coolant temperature has risen by at least 40 degrees Fahrenheit from engine starting and reaches a minimum temperature of 160 degress Fahrenheit.
> - A "driving cycle" consists of engine startup, vehicle operation beyond the beginning of closed loop operation.

DIAGNOSTIC TROUBLE CODES

DTC NO.	CONTENT	Memory	MIL
P0030	O2 Sensor Heater - Heater Control Circuit (Bank 1 / Sensor 1)	O	O
P0031	O2 Sensor Heater Circuit low (Bank 1 / Sensor 1)	O	O
P0032	O2 Sensor Heater Circuit high (Bank 1 / Sensor 1)	O	O
P0036	O2 Sensor Heater - Heater Control Circuit (Bank 1 / Sensor 2)	O	X
P0037	O2 Sensor Heater Circuit low (Bank 1 / Sensor 2)	O	O
P0038	O2 Sensor Heater Circuit high (Bank 1 / Sensor 2)	O	O
P0106	MAP Sensor Rationality	O	O
P0107	MAP Sensor Range Check Low	O	O
P0108	MAP Sensor Range Check High	O	O
P0111	Intake Air Temperature Circuit Range / Performance	O	O
P0112	Intake Air Temperature Circuit Low Input	O	O
P0113	Intake Air Temperature Circuit High Input	O	O
P0116	Engine Coolant Temperature Circuit Range / Performance	O	O
P0117	Engine Coolant Temperature Circuit Low Input	O	O
P0118	Engine Coolant Temperature Circuit High Input	O	O
P0121	Throttle / Pedal Position Circuit Range / Performance Problem	O	X
P0122	Throttle / Pedal Position Circuit Low Input	O	O
P0123	Throttle / Pedal Position Circuit High Input	O	O
P0128	Coolant Thermostat (Coolant Temp. below Thermostat Regulating Temp.)	O	O
P0130	O2 Sensor Circuit (Bank 1 / Sensor 1)	O	O
P0131	O2 Sensor Circuit Low Input (Bank 1 / Sensor 1)	O	O
P0132	O2 Sensor Circuit High Input (Bank 1 / Sensor 1)	O	O
P0133	O2-Sensor Circuit Slow Response (Bank 1 / Sensor 1)	O	O
P0134	O2 Sensor Circuit No Activity Detected (Bank 1 / Sensor 1)	O	O
P0136	O2 Sensor Circuit Malfunction (Bank 1 / Sensor 2)	O	O
P0137	O2 Sensor Circuit Low Input (Bank 1 / Sensor 2)	O	O
P0138	O2 Sensor Circuit High Input (Bank 1 / Sensor 2)	O	O
P0140	O2 Sensor Circuit No Activity Detected (Bank 1 / Sensor 2)	O	O
P0171	Fuel Trim Malfunction - System Too Lean (Bank 1)	O	O
P0172	Fuel Trim Malfunction - System Too Rich (Bank 1)	O	O
P0230	Fuel Pump Circuit Malfunction	O	X
P0261	Cylinder 1 - Injector Circuit Low	O	O

P0264	Cylinder 2 - Injector Circuit Low	O	O
P0267	Cylinder 3 - Injector Circuit Low	O	O
P0270	Cylinder 4 - Injector Circuit Low	O	O
P0262	Cylinder 1 - Injector Circuit High	O	O
P0265	Cylinder 2 - Injector Circuit High	O	O
P0268	Cylinder 3 - Injector Circuit High	O	O
P0271	Cylinder 4 - Injector Circuit High	O	O
P0300	Multiple Cylinder Misfire Detected	O	O
P0301	Cylinder 1 - Misfire detected	O	O
P0302	Cylinder 2 - Misfire detected	O	O
P0303	Cylinder 3 - Misfire detected	O	O
P0304	Cylinder 4 - Misfire detected	O	O
P0325	Knock Sensor 1 Circuit Malfunction	O	X
P0335	Crankshaft Position Sensor Circuit Malfunction	O	O
P0336	Crankshaft Position Sensor Circuit Range/Performance	O	O
P0340	Camshaft Position Sensor Circuit Malfunction(Bank1 or Single Sensor)	O	O
P0420	Catalyst System Efficiency below Threshold (Bank 1)	O	O
P0441	Evap. Emission Ctrl. System Incorrect Purge Flow	O	O
P0442	Evap. Emission Ctrl. System - Small Leak detected (1.0 mm)	O	O
P0444	Evap. Emission Ctrl. System - Purge Ctrl. Valve Circuit Open	O	O
P0445	Evap. Emission Ctrl. System - Purge Ctrl. Valve Circuit Shorted	O	O
P0461	Fuel Level Sensor Circuit Range/Performance	O	X
P0462	Fuel Level Sensor Circuit Low Input	O	X
P0463	Fuel Level Sensor Circuit High Input	O	X
P0501	Vehicle Speed Sensor Range / Performance	O	O
P0506	Idle Control System - RPM lower than expected	O	O
P0507	Idle Control System - RPM higher than expected	O	O
P0562	System Voltage Low	O	O
P0563	System Voltage High	O	O
P0605	Internal Control Module Read Only Memory(ROM) Error	O	O
P0650	Malfunction Indicator Lamp(MIL) Control Circuit Malfunction	O	O
P1307	Acceleration Sensor - Rationality	O	O
P1308	Acceleration Sensor - Signal Check Low	O	O
P1309	Acceleration Sensor - Signal Check High	O	O

P1401	DMTL Malfunction	O	O
P1402	Power Stage (DMTL Motor)	O	O
P1403	Power Stage (DMTL Valve)	O	O
P1404	DMTL Heater	O	O
P1505	Idle Charge Actuator Signal Low of Coil #1	O	O
P1506	Idle Charge Actuator Signal High of Coil #1	O	O
P1507	Idle Charge Actuator Signal Low of Coil #2	O	O
P1508	Idle Charge Actuator Signal High of Coil #2	O	O
P1586	MT/AT Encoding Error	O	O
P1690	Smartra Error (Immobilizer)	O	X
P1691	Antena Error (Immobilizer)	O	X
P1693	Transponder Error (Immobilizer)	O	X
P1694	ECU Siganl Error (Immobilizer)	O	X
P1695	EEEPROM Error (Immobilizer)	O	X

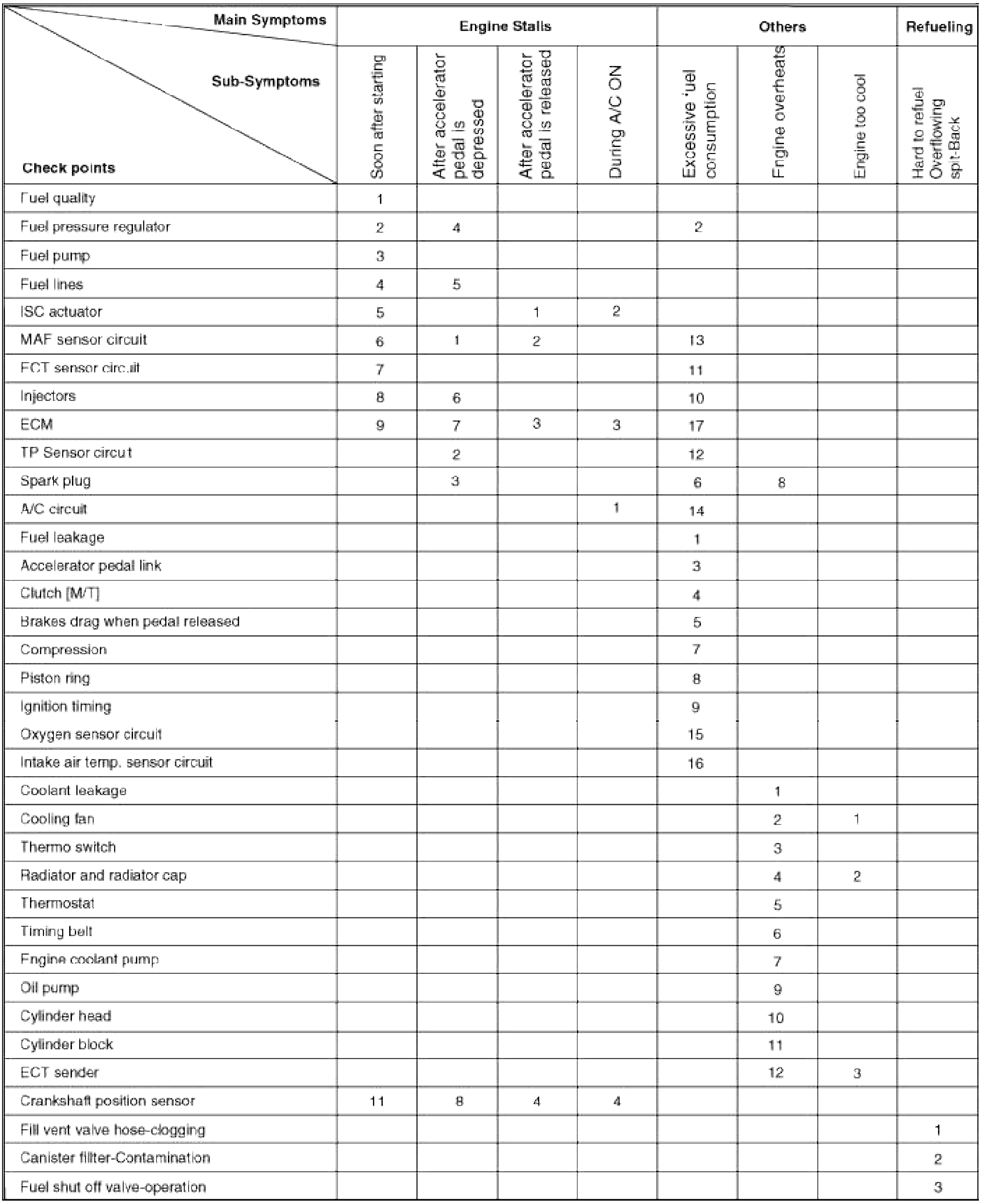
Fuel System > General Information > Troubleshooting

BASIC TROUBLESHOOTING

1. Power supply
    - A. Battery
    - B. Fusible link
    - C. Fuse
2. Body ground
3. Fuel supply
    - A. Fuel line
    - B. Fuel filter
    - C. Fuel pump
4. Ignition system
    - A. Spark plug
    - B. High-tension cable
    - C. Ignition coil
5. Emission control system
    - A. PCV system
    - B. Vacuum leak
6. Others
    - A. Ignition timing
    - B. Idle speed

TROUBLESHOOTING GUIDE CHART

Main Symptoms	STARTING							Poor Idling					Poor Driving	
	Unable to start			Difficult to start										
Sub-Symptoms **Check points**	Engine does not turn over	Starter runs but engine does not turn over	Incomplete combustion	Engine turns over	Always	When the engine is cold	When the engine is hot	Incorrect fast idle	High idle speed	Low idle speed	Rough idling	Engine hesitates or accelerates poorly	Surging	Knocking
Starter relay	1													
Starter	2	2		1										
Park/Neutral SW [A/T] or Clutch start SW [M/T]	3													
Flywheel [M/T] or Drive plate [A/T]		4												
Mass air flow sensor circuit			3							3	10	7		
Idle speed control actuator			4		3	3	3	3	3	2	7			2
Fuel pressure regulator			5		5	5	5				4	11	1	
ECT sensor circuit			6		4	1	1	2	2	1	2	8	6	
Compression			7		8						8	5		
Piston rings			8		9						9			
Ignition timing					10						11	14		
Timing mark			9								12			
Injectors			10		13	8	8		7	4	13	15	4	
PCM			11		14	9	9	4	8	5	14	16	5	
A/C circuit				2					6					
Connecting rod bearing				3										
Crankshaft bearing				4										
Fuel quality					1	2	2				1	3	3	
Spark plugs					2						3	4	2	
Fuel pump					6	6	6				5	12		
Fuel lines					7	7	7				6	13		
Ignition circuit			2		11									3
Intake air temp. sensor circuit					12	4	4		4			9		1
Accelerator pedal link								1	1					
TP Sensor circuit									5			6		
Cylinder head											15			
Clutch [M/T]												1		
Brakes not releasing properly												2		
Oxygen sensor circuit												10		
Crankshaft position sensor		3												
Battery voltage		1	1											



Main Symptoms Sub-Symptoms Check points	Engine Stalls				Others			Refueling
	Soon after starting	After accelerator pedal is depressed	After accelerator pedal is released	During A/C ON	Excessive fuel consumption	Engine overheats	Engine too cool	Hard to refuel Overflowing spit-Back
Fuel quality	1							
Fuel pressure regulator	2	4			2			
Fuel pump	3							
Fuel lines	4	5						
ISC actuator	5		1	2				
MAF sensor circuit	6	1	2		13			
ECT sensor circuit	7				11			
Injectors	8	6			10			
ECM	9	7	3	3	17			
TP Sensor circuit		2			12			
Spark plug		3			6	8		
A/C circuit				1	14			
Fuel leakage					1			
Accelerator pedal link					3			
Clutch [M/T]					4			
Brakes drag when pedal released					5			
Compression					7			
Piston ring					8			
Ignition timing					9			
Oxygen sensor circuit					15			
Intake air temp. sensor circuit					16			
Coolant leakage						1		
Cooling fan						2	1	
Thermo switch						3		
Radiator and radiator cap						4	2	
Thermostat						5		
Timing belt						6		
Engine coolant pump						7		
Oil pump						9		
Cylinder head						10		
Cylinder block						11		
ECT sender						12	3	
Crankshaft position sensor	11	8	4	4				
Fill vent valve hose-clogging								1
Canister fillter-Contamination								2
Fuel shut off valve-operation								3

NOTE

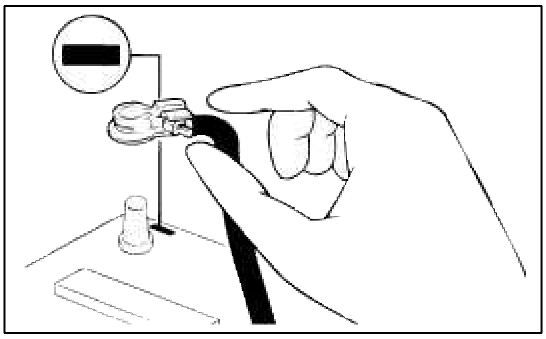
The number herein means the check order.

Fuel System > General Information > Repair procedures

REPLACEMENT

FUEL FILTER AND PUMP REPLACEMENT

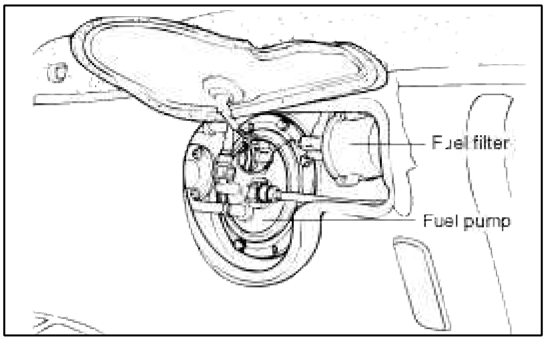
1. Reduce the internal pressure of the fuel lines and hoses by completing the following operations.
   - A. After removing the rear seat cushion, disconnect the fuel pump harness.
   - B. Start the engine. Allow it to stop by itself, then turn the ignition switch OFF.
   - C. Disconnect the battery negative (-) terminal.
   - D. Connect the fuel pump harness connector.



2. Remove the eye bolts while holding the fuel filter nuts securely.

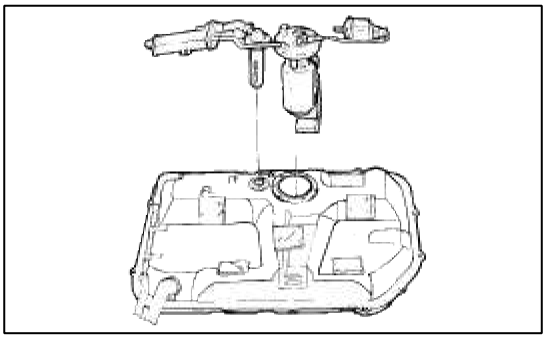
> **CAUTION**
>
> Cover the fuel filter with a shop towel to avoid residual gasoline from splashing.

3. Remove the fuel filter mounting bolts, then remove the fuel filter from the fuel filter clamp.
4. After replacing the fuel filter, check for fuel leaks.



FUEL SENDER REPLACEMENT

1. Remove the fuel tank cap to lower the fuel tank's internal pressure.
2. Remove the fuel sender mounting screws, then remove the fuel sender from the fuel tank.



INSPECTION

SERVICE ADJUSTMENT PROCEDURES

> **NOTE**
>
> Before adjusting, check that the spark plugs, injectors, idle speed control actuator (ISC actuator), compression etc. are normal.

CHECK CONDITIONS

- Engine coolant temperature is 80 to 95°C (176 to 205°F).
- Lights, electric cooling fan and all accessories are off.
- Transaxle is in neutral ("P" or "N" range for A/T vehicles).
- Steering wheel is in a straight forward position (Vehicles with power steering).

1. Install a tachometer to the primary coil side or connect the scan tool to the data link connector.
2. Start and run the engine at curb idle speed.
3. Run the engine for more than 5 seconds at an engine speed of 2,000 to 3,000 rpm. Then, run the engine at idle for 2 minutes.
4. Read the idling rpm.

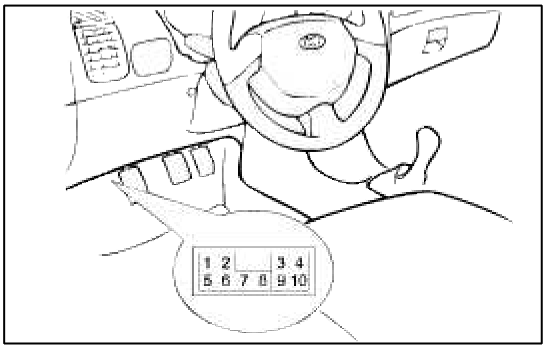
Idle speed
SOHC : 800 ± 100 rpm
DOHC : 750 ± 100 rpm

FUEL PUMP OPERATING CHECK

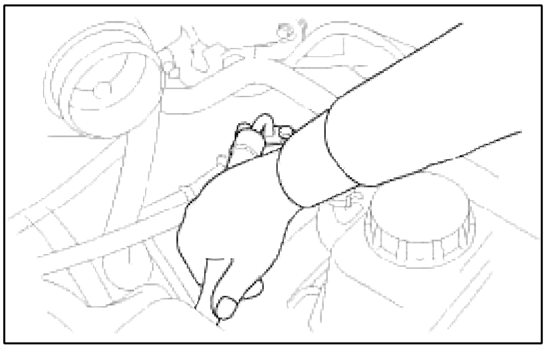
1. Turn the ignition switch OFF.
2. Apply battery voltage to the fuel pump drive connector to check that the pump operates.

NOTE

The fuel pump is an in-tank type and its operation is hard to hear without removing the fuel tank cap.

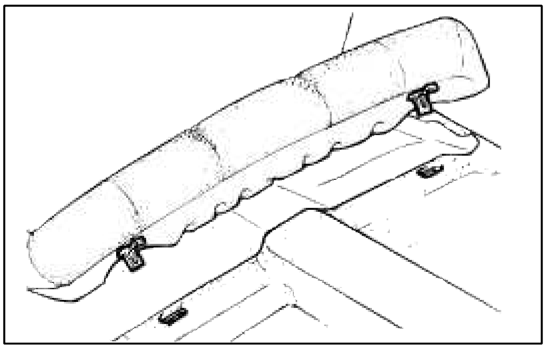


3. Pinch the hose to check that fuel pressure is felt.



FUEL PRESSURE TEST

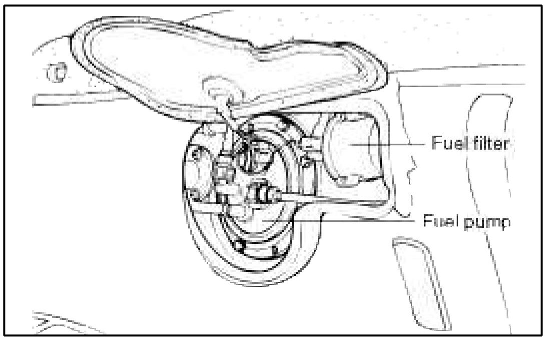
1. Press the two taps under the rear seat and raise the seat, then detach the inspection panel of the fuel pump.



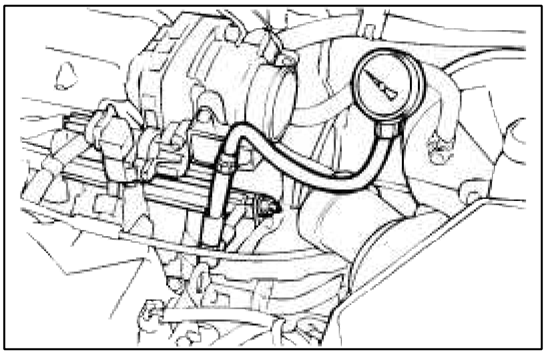
2. To reduce the internal pressure of the fuel lines and hoses, first start the engine with the fuel pump disconnected and wait until it stops by itself.

NOTE

Be sure to reduce the fuel pressure before disconnecting the fuel main pipe and hose, otherwise fuel will spill out.



3. Disconnect the battery negative (-) terminal and then connect the fuel pump harness connector.
4. Using the fuel pressure gauge adapter (09353-24000, 09353-24100, 09353-38000), install the fuel-pressure gauge to the fuel rail. Tighten the bolt to the specified torque.



Tighteningg Torque

Fuel pressure gauge to fuel filter :
25 ~ 35 Nm (250 ~ 350 kg·cm, 18 ~ 26 lb·ft)

---

5. Connect the battery's negative (-) terminal.
6. Apply battery voltage to the terminal for the pump drive and activate the fuel pump. Then, with fuel pressure applied, check that there is no fuel leak from the pressure gauge or connections.
7. Start the engine and let it idle.
8. Measure the fuel pressure.

---

350 kPa (3.5 kg/cm², 49.8 psi)

---

9. If the result of the measurements made in steps (7) and (8) are not within the standard value, use the table below to determine the probable cause, and make the necessary repairs.

Condition	Probable cause	Remedy
Fuel pressure too low	1) Clogged fuel filter. 2) Fuel leak on the return side, caused by poor seating of the fuel-pressure regulator.	1) Replace fuel filter. 2) Replace fuel pump.
Fuel pressure too high	1) Sticking fuel-pressure regulator. 2) Clogged or bent fuel return hose or pipe.	1) Replace fuel pump. 2) Repair or replace hose or pipe.

10. Stop the engine and check for a change in the fuel pressure gauge reading, which should hold for approximately 5 minutes. If the gauge indication drops, observe the rate of drop. Determine and remove the causes according to the following table.

Condition	Probable cause	Remedy
Fuel pressure drops slowly after engine is stopped	1) Injector leak.	1) Replace injector.
Fuel pressure drops immediately after engine is stopped	1) The check valve within the fuel pump is open.	1) Replace fuel pump.

11. Reduce the pressure in the fuel line.
12. Disconnect the hose and the gauge.

> **CAUTION**
>
> Cover the hose connection with a shop towel to prevent splashing of fuel caused by residual fuel pressure in the fuel line.

13. Replace the O-ring at the end of the hose.
14. Connect the fuel hose to the delivery pipe and tighten with the specified torque.
15. Check for fuel leaks.

Fuel System > General Information > Specifications

SPECIFICATIONS (1.5 SOHC, 1.6 DOHC)

Items	Specifications
Engine displacement Engine Management System (EMS)	1.5ℓ, 1.6ℓ BOSCH
Fuel tank - Capacity Fuel filter Fuel pump Throttle body - Throttle position sensor (TP Sensor) - Output voltage at idle - Output voltage at fully open	45ℓ (11.9 U.S. gal., 9.9 lmp.gal.) High pressure type Electrical, in-tank type Variable resister type 0.3 ~ 0.9V 4.5 ~ 5.2V
Input sensors Manifold absolute pressure (MAP) sensor - Type - Output voltage Knock sensor Intake Air Temperature sensor (IAT Sensor) - Voltage EVAP Canister Purge solenoid valve - Resistance Engine coolant temperature sensor (ECT Sensor) - Voltage Heated oxygen sensor (HO2S) - Output voltage (V) Vehicle speed sensor Camshaft position sensor (CMP Sensor) - Output voltage (V) Crankshaft position sensor (CKP Sensor) - Output frequency (Hz)	Piezo-Resistivity type 0 ~ 5V Piezoelectric type Thermistor type 3.3 ~ 3.7V at 20°C (68°F) Duty type 26Ω Thermistor type 3.44V ± 0.3 at 20°C (68°F) 1.25V ± 0.3 at 80°C (176°F) Zirconia sensor (Heated) 0 ~ 1V Hall effect sensor Hall effect sensor 0 ~ 5V Magnetic inductive type Idle rpm : 600 ~ 900Hz 3000 rpm : 2700 ~ 3300Hz
Output actuators Injector - Type - Number - Coil resistance (Ω) Fuel pressure regulator - Regulator pressure Idle speed control actuator (ISC Actuator) - Type - Control frequency (Hz)	Electromagnetic type 4 15.9 ± 0.35Ω Bulit in Fuel Pump Assembly 350 kPa (3.5 kg/cm², 49.8 psi) Double coil type 100Hz

SPECIFICATIONS (1.5 SOHC, 1.6 DOHC)

Items	Specifications
Engine displacement Engine Management System (EMS)	1.5ℓ, 1.6ℓ BOSCH
Fuel tank - Capacity Fuel filter Fuel pump Throttle body - Throttle position sensor (TP Sensor) - Output voltage at idle - Output voltage at fully open	45ℓ (11.9 U.S. gal., 9.9 lmp.gal.) High pressure type Electrical, in-tank type Variable resister type 0.3 ~ 0.9V 4.5 ~ 5.2V
Input sensors Manifold absolute pressure (MAP) sensor - Type - Output voltage Knock sensor Intake Air Temperature sensor (IAT Sensor) - Voltage EVAP Canister Purge solenoid valve - Resistance Engine coolant temperature sensor (ECT Sensor) - Voltage Heated oxygen sensor (HO2S) - Output voltage (V) Vehicle speed sensor Camshaft position sensor (CMP Sensor) - Output voltage (V) Crankshaft position sensor (CKP Sensor) - Output frequency (Hz)	Piezo-Resistivity type 0 ~ 5V Piezoelectric type Thermistor type 3.3 ~ 3.7V at 20°C (68°F) Duty type 26Ω Thermistor type 3.44V ± 0.3 at 20°C (68°F) 1.25V ± 0.3 at 80°C (176°F) Zirconia sensor (Heated) 0 ~ 1V Hall effect sensor Hall effect sensor 0 ~ 5V Magnetic inductive type Idle rpm : 600 ~ 900Hz 3000 rpm : 2700 ~ 3300Hz
Output actuators Injector - Type - Number - Coil resistance (Ω) Fuel pressure regulator - Regulator pressure Idle speed control actuator (ISC Actuator)	Electromagnetic type 4 15.9 ± 0.35Ω Bulit in Fuel Pump Assembly 350 kPa (3.5 kg/cm², 49.8 psi)

Actuator) - Type - Control frequency (Hz)	Double coil type 100Hz

SERVICE STANDARD

Items	Engine	Specifications	Condition
Basic idle RPM	SOHC	800 ± 100	A/CON "ON" or "OFF (N-range)
	DOHC	750 ± 100	A/CON "ON" or "OFF (N-range)
Ignition timing (°) (at idle RPM)	SOHC	9° ± 5°	A/CON "OFF" (N-range)
	DOHC	9° ± 5°	A/CON "OFF" (N-range)

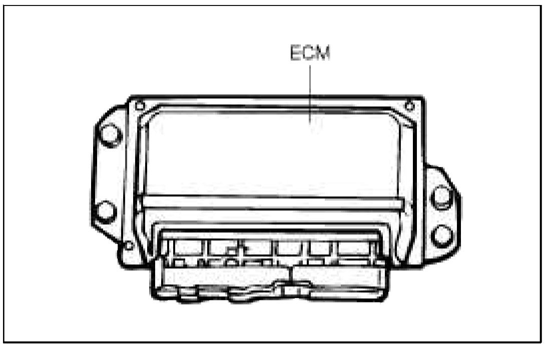
TIGHTENGING TORQUE

Items	Nm	Kg·cm	lb·ft
Delivery pipe installation	10 ~ 15	100 ~ 150	7 ~ 11
Heated oxygen sensor	50 ~ 60	500 ~ 600	37 ~ 44
Crankshaft position sensor installation bolts	9 ~ 11	90 ~ 110	7 ~ 8
Knock sensor installation bolt	16 ~ 25	160 ~ 250	12 ~ 18
Engine coolant temperature sensor (SOHC)	15 ~ 20	150 ~ 200	11 ~ 15
Engine coolant temperature sensor (DOHC)	25 ~ 30	250 ~ 300	18 ~ 22
Throttle position sensor installation bolts	1.5 ~ 2.5	15 ~ 25	1.1 ~ 1.8
Throttle body to surge tank bolts	15 ~ 20	150 ~ 200	11 ~ 15
Accelerator arm bracket	8 ~ 12	80 ~ 120	5.8 ~ 7.2
Fuel pressure gauge to fuel filter	25 ~ 35	250 ~ 350	18 ~ 26
Intake manifold	15 ~ 20	150 ~ 200	11 ~ 15
Accelerator bracket	8 ~ 12	80 ~ 120	5.8 ~ 7.2
MFI control relay	7 ~ 11	70 ~ 110	5.2 ~ 8.1

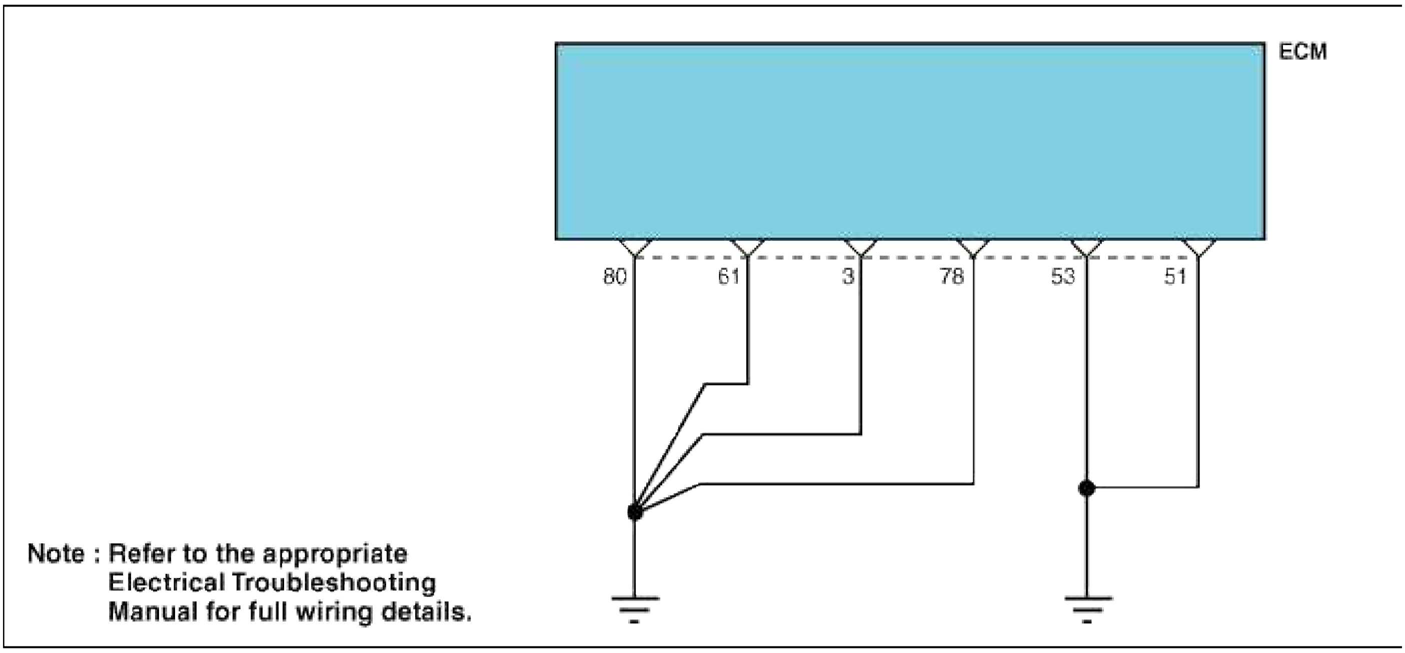
Fuel System > Engine Control System > Engine Control Module (ECM) > Troubleshooting

ENGINE CONTROL MODULE (ECM) - POWER GROUND

Check the ground condition of the engine control module.

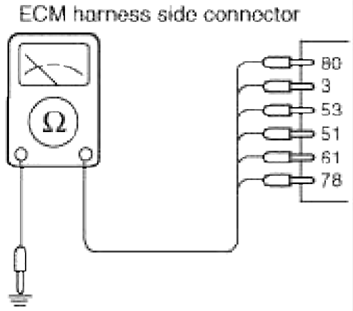


CIRCUIT DIAGRAM


ECM
80
61
3
78
53
51

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

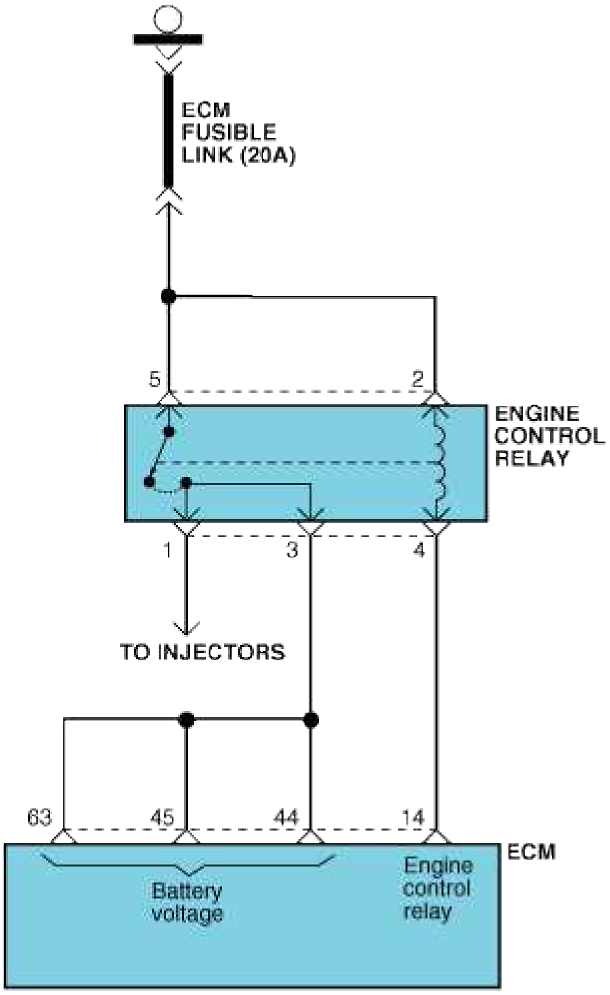
HARNESS INSPECTION PROCEDURE

 ECM harness side connector Ω 80 3 53 51 61 78	Check for continuity of the ground circuit. • ECM connector : Disconnected	**OK** ⇨ **NG** ⇨	**END!** Repair the harness.

MFI CONTROL RELAY

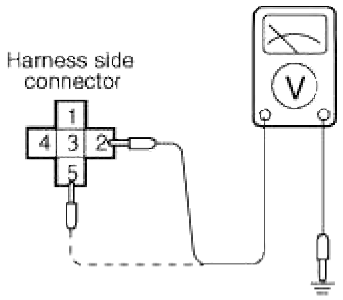
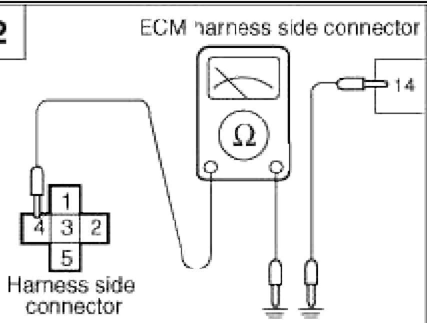
When the ignition switch is on, battery power is supplied to the ECM, the injectors, the MAP sensor, etc. While the ignition switch is turned on, current flows from the ignition switch through the current relay coil to ground.

CIRCUIT DIAGRAM


ECM FUSIBLE LINK (20A)
5
2
ENGINE CONTROL RELAY
1
3
4
TO INJECTORS
63
45
44
14
ECM
Battery voltage
Engine control relay

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

HARNESS INSPECTION PROCEDURES

1  Harness side connector 1 4 3 2 5 V	Measure the power supply voltage of the MFI control relay. • MFI control relay connector : Disconnected • Voltage (V) : Battery voltage	**OK** ⇨ **NG** ⇨	2 Repair the harness.
2  ECM harness side connector 14 Ω 1 4 3 2 5 Harness side connector	Check for open-circuit or short-circuit to ground between the engine control module and the MFI control relay. • ECM connector : Disconnected • MFI control relay : Disconnected	**OK** ⇨ **NG** ⇨	**END!** Repair the harness.

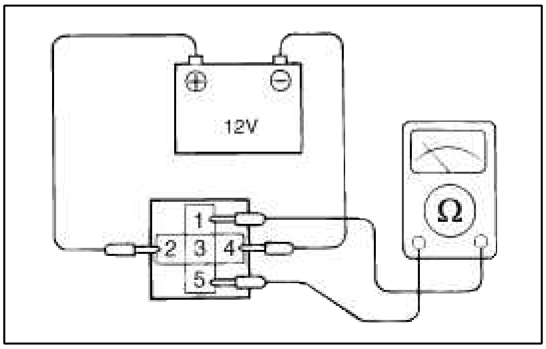
MFI CONTROL RELAY INSPECTION

1. Check continuity of relay contacts between terminals 5 (+) and 1 (-).

Relay coil (between terminal 2 & 4)	Continuity
When de-energized	No
When energized	Yes

2. If faulty, replace the MFI control relay.

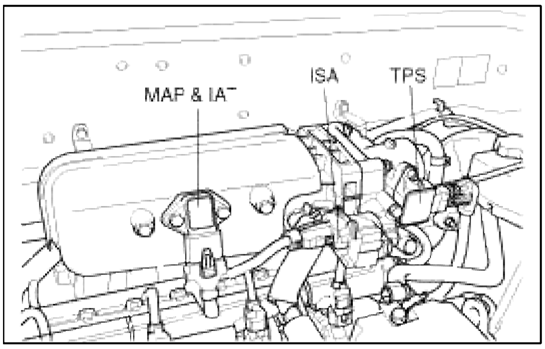
Tightening torque
MFI control relay :
7 ~ 11 Nm (70 ~ 110 kg·cm, 5.2 ~ 8.1 lb·ft)



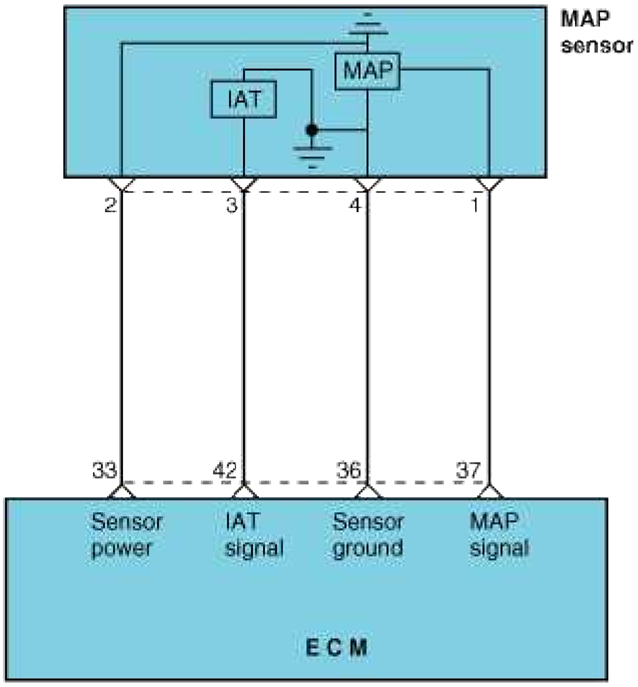
Fuel System > Engine Control System > Manifold Absolute Pressure Sensor (MAPS) > Troubleshooting

MANIFOLD ABSOLUTE PRESSURE SENSOR (MAP SENSOR)

The manifold absolute pressure (MAP) sensor is a pressure sensitive variable resistor. It measures changes in the intake manifold pressure which result from engine load and speed changes, and converts this to a voltage output. The MAP sensor is also used to measure barometric pressure at start up, and under certain conditions, allows the ECM to automatically adjust for different altitudes. The ECM supplies 5 volts to the MAP sensor and monitors the voltage on a signal line. The sensor provides a path to ground through its variable resistor. The MAP sensor input affects fuel delivery and ignition timing controls in the ECM.



CIRCUIT DIAGRAM



Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TROUBLESHOOTING HINTS

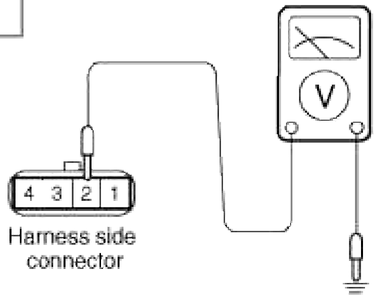
The MIL (Malfunction Indicator Lamp) is ON or the DTC (Diagnostic Trouble Code) is displayed on the HI-SCAN under the following conditions;

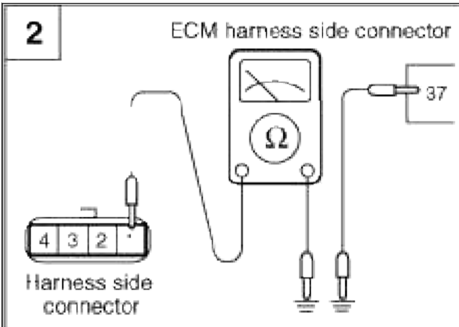
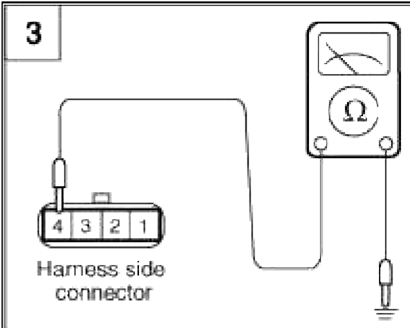
1. When the manifold pressure is 118mb or lower for 0.1 second after turning the ignition key ON.
2. When the manifold pressure is 118mb or lower while the RPM is below 1980rpm.
3. When the manifold pressure is 986mb or higher and the rpm is 2400rpm or more while the accelerator pedal is released (such as when a vehicle is moving down on a sloping road).

USING HI-SCAN

Check item	Data display	Check conditions	Engine state	Test specification
MAP sensor	Intake manifold pressure	• Engine coolant temperature : 80 to 95° (176 to 205°F) • Lamps, electric cooling fan, accessory units : ALL OFF • Transaxle : Neutral (P range for vehicle with A/T) • Steering wheel : Neutral	IG. KEY "ON"	800 ~ 1080 mb
			Idle	190 ~ 390 mb

HARNESS INSPECTION PROCEDURES

1 	Measure the power supply voltage. • Connector : Disconnected • Ignition switch : ON • Voltage (V) : 4.8 ~ 5.2V	**OK** ⇨ **2** **NG** ⇨ Repair the harness.

2 	Check for an open-circuit, or a short-circuit to ground between the engine control module and MAP sensor. • MAP sensor circuit : Disconnected • Engine control module connector : Disconnected	OK ⇨ NG ⇨	3 Repair the harness.
3 	Check for continuity of the ground circuit. • Connector : Disconnected	OK ⇨ NG ⇨	END! Repair the harness.

SENSOR INSPECTION

1. Measure the voltage between terminals 1 and 4 of the MAP sensor connectors.
   Terminal 4 : MAP sensor ground
   Terminal 1 : MAP sensor output

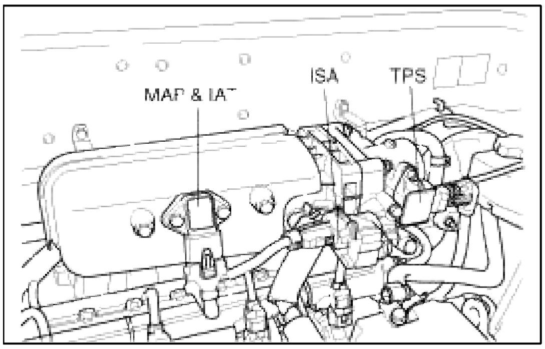
Engine state	Test specification
Ignition SW. ON.	4 ~ 5V
At idle	1.14 ± 0.4V

2. If the voltage deviates from the standard value, replace the MAP sensor assembly.

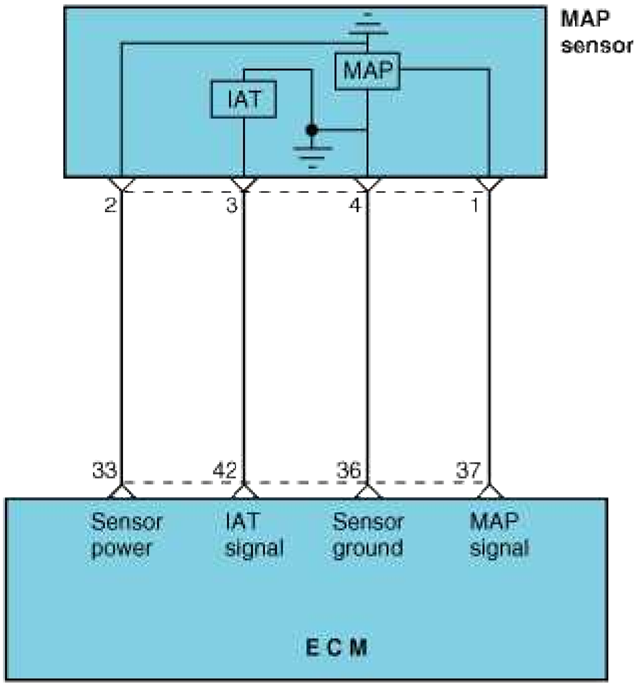
Fuel System > Engine Control System > Intake Air Temperature Sensor (IATS) > Troubleshooting

INTAKE AIR TEMPERATURE SENSOR (IAT SENSOR)

The intake air temperature sensor (IAT Sensor), built-in type in the MAP sensor, is a resistor-based sensor which detects the intake air temperature. According to the intake air temperature reading, the ECM will control the necessary amount of fuel injection.



CIRCUIT DIAGRAM


MAP
sensor
MAP
IAT
2
3
4
1
33
42
36
37
Sensor power
IAT signal
Sensor ground
MAP signal
E C M

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TROUBLESHOOTING HINTS

The MIL is ON or the DTC is displayed on the HI-SCAN under the following condition;

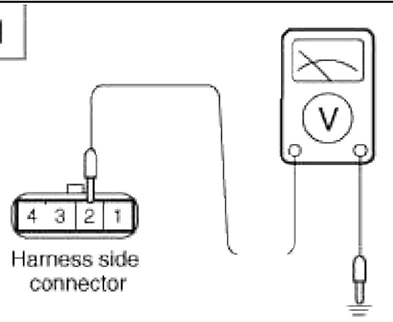
- When the intake air temperature is detected below -40°C or higher than 120°C.

USING HI-SCAN

Check item	Data display	Check conditions	Engine state	Test specification
Intake air temperature sensor	Air temperature	Ignition switch : ON or engine running	When 0°C (32°F)	4.0 ~ 4.4V
			When 20°C (68°F)	3.3 ~ 3.7V
			When 40°C (104°F)	2.5 ~ 2.9V
			When 80°C (176°F)	1.0 ~ 1.4V

HARNESS INSPECTION PROCEDURES

1


4 3 2 1
Harness side connector
V

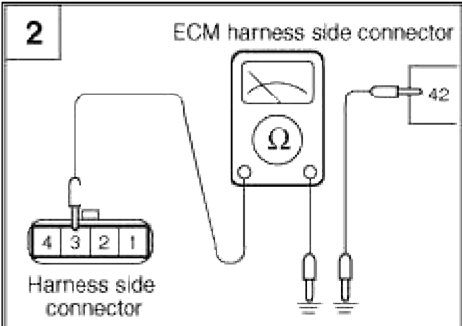
Measure the power supply voltage of the IAT Sensor.

- Connector : Disconnected
- Ignition switch : ON
- Voltage : 4.8 ~ 5.2V

OK ⇨ **2**

NG ⇨ Repair the harness.

2


ECM harness side connector
42
Ω
4 3 2 1
Harness side connector

Check for an open-circuit, or a short-circuit to ground between the engine control module and the IAT sensor.

- ECM connector : Disconnected
- IAT sensor connector : Disconnected

OK ⇨ **END!**

NG ⇨ Repair the harness.

SENSOR INSPECTION

1. Using a multimeter, measure the IAT sensor resistance between terminals 3 and 4.

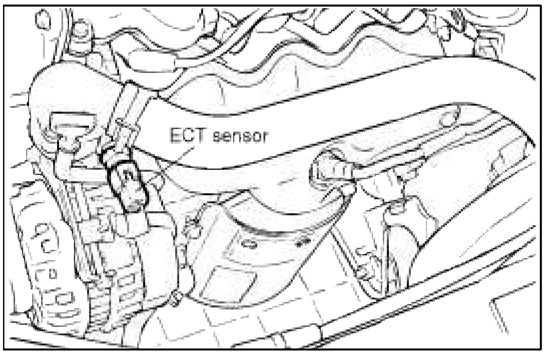
IG. SW. ON	**Temperature °C (°F)**	**Resistance (kΩ)**
	0 (32)	4.5 ~ 7.5
	20 (68)	2.0 ~ 3.0
	40 (104)	0.7 ~ 1.6
	80 (176)	0.2 ~ 0.4

2. If the resistance deviates from the standard value, replace the intake air temperature sensor assembly.

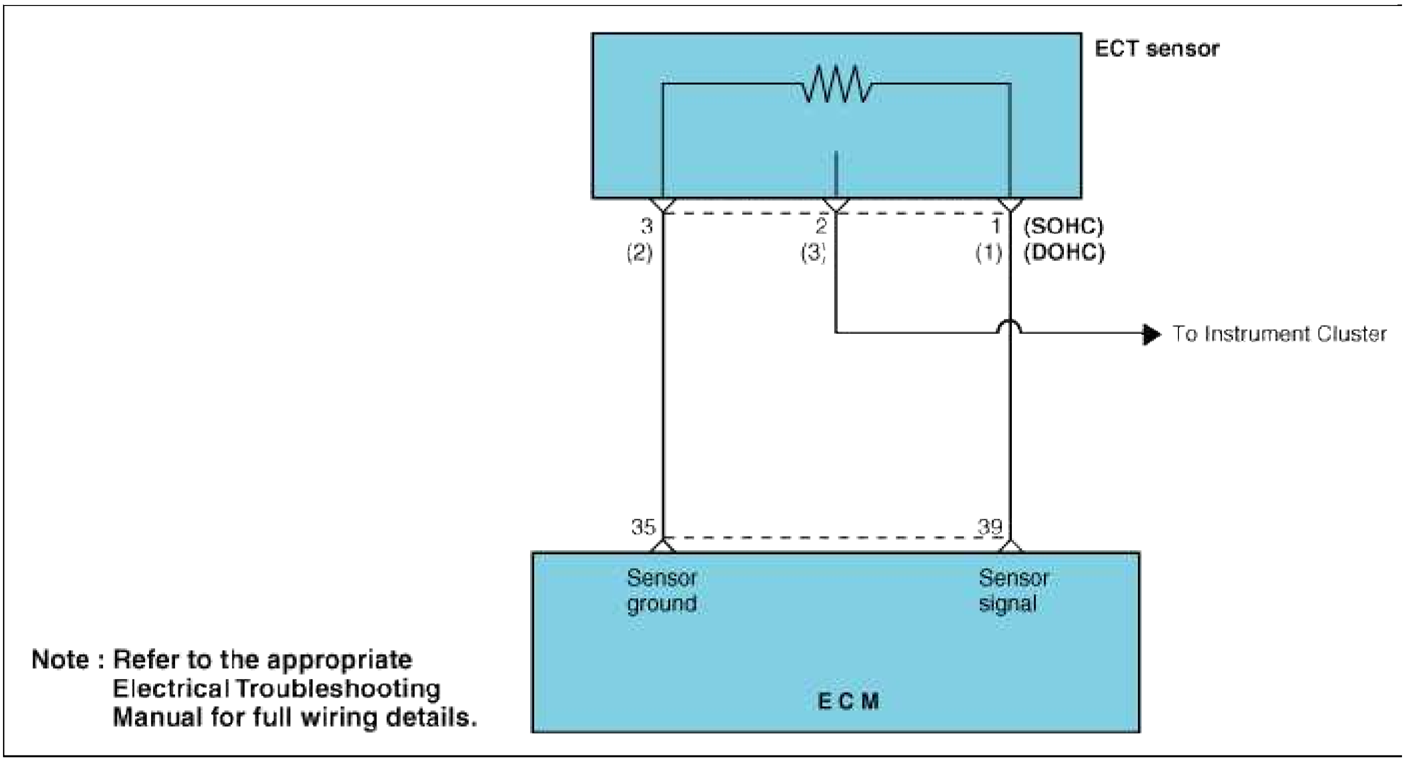
Fuel System > Engine Control System > Engine Coolant Temperature Sensor (ECTS) > Troubleshooting

ENGINE COOLANT TEMPERATURE SENSOR (ECT SENSOR)

The engine coolant temperature sensor is located in the engine coolant passage of the cylinder head. It detects the engine coolant temperature and relays signals to the ECM. It employs a thermistor which is sensitive to changes in temperature. The electric resistance of a thermistor decreases in response to temperature increase. The ECM judges engine coolant temperature by the sensor output voltage and provides optimum fuel enrichment when the engine is cold.



CIRCUIT DIAGRAM


ECT sensor
3
(2)
2
(3)
1
(1)
(SOHC)
(DOHC)
To Instrument Cluster
35
39
Sensor
ground
Sensor
signal
E C M

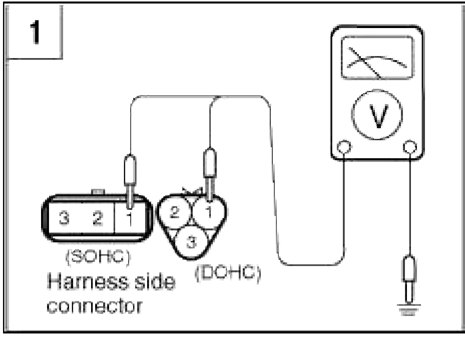
Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

USING HI-SCAN

Check item	Data display	Check conditions	Engine state	Test specification
Engine coolant temperature sensor	Sensor temperature	Ignition switch : ON or engine running	When 0°C (32°F)	4.27V ± 0.3
			When 20°C (68°F)	3.44V ± 0.3
			When 40°C (104°F)	2.72V ± 0.3
			When 80°C (176°F)	1.25V ± 0.3

HARNESS INSPECTION PROCEDURES

1

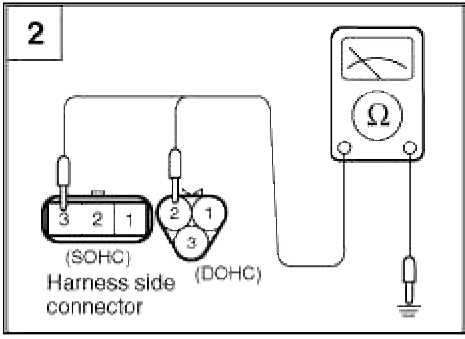

V
3
2
1
(SOHC)
Harness side
connector
2
1
3
(DOHC)

Measure the power supply voltage.
- Connector : Disconnected
- Ignition switch : ON
- Voltage : 4.8 ~ 5.2V

OK ⇨ **2**

NG ⇨ Repair the harness.

2


Ω
3
2
1
(SOHC)
Harness side
connector
2
1
3
(DOHC)

Check for continuity of the ground circuit.
- Connector : Disconnected

OK ⇨ **END!**

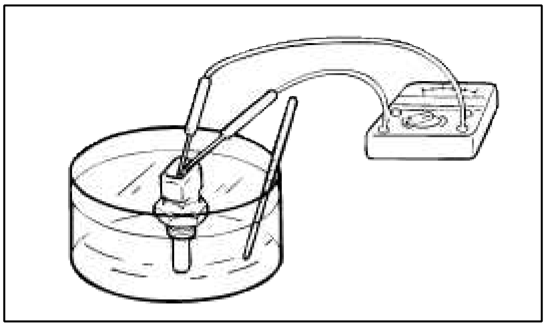
NG ⇨ Repair the harness.

SENSOR INSPECTION

1. Remove the engine coolant temperature sensor from the intake manifold.

2. With the temperature sensing portion of the engine coolant temperature sensor immersed in hot water, check resistance.

Temperature °C (°F)	Resistance (kΩ)
-30 (-22)	22.22 ~ 31.78
-10 (14	8.16 ~ 10.74
0 (32)	5.18 ~ 6.60
20 (68)	2.27 ~ 2.73
40 (104)	1.059 ~ 1.281
60 (140)	0.538 ~ 0.650
80 (176)	0.298 ~ 0.322
90 (194)	0.219 ~ 0.243



3. If the resistance greatly deviates from the standard value, replace the sensor.

INSTALLATION

1. Apply sealant LOCTITE 962T or equivalent to threaded portion.
2. Install engine coolant temperature sensor and tighten it to specified torque.

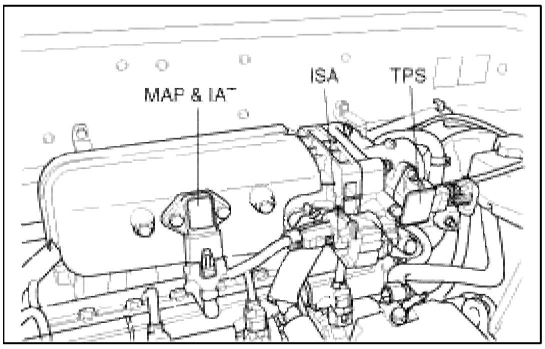
Tightening torque
Engine coolant temperature sensor
SOHC: 15~20 Nm (150~200 kg·cm, 11~15 lb·ft)
DOHC: 25~30 Nm (250~300 kg·cm, 18~22 lb·ft)

3. Connect the harness connector securely.

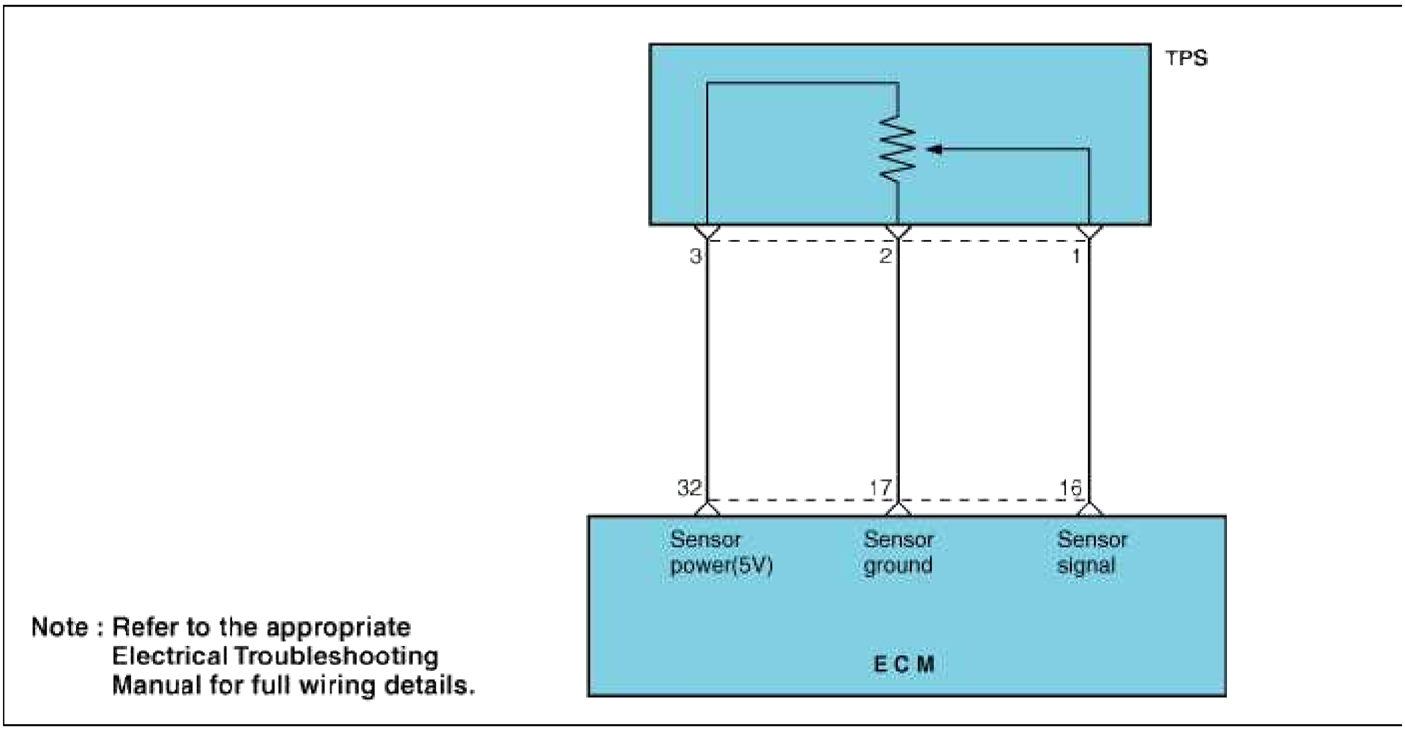
Fuel System > Engine Control System > Throttle Position Sensor (TPS) > Troubleshooting

THROTTLE POSITION SENSOR (TPS)

The TP Sensor is a rotating type variable resistor that rotates with the throttle body's throttle shaft to sense the throttle valve angle. As the throttle shaft rotates, the throttle angle of the TP Sensor changes and the ECM detects the throttle valve opening based on the TPS output voltage.



CIRCUIT DIAGRAM



Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TROUBLESHOOTING HINTS

1. The TPS signal is important for the control of the automatic transaxle. Shift shock and other trouble may occur if the sensor is faulty.
2. If the idle condition or acceleration is abnormal, check the TPS connector. (When the TPS connector is not connected properly, the current data on HI-SCAN can show that the idle state remains off, although the accelerater pedal is released. This results in the improper idle or acceleration.)
3. Input voltage from throttle position sensor is below 0.1V or above 4.7V when ignition switch is turned on.

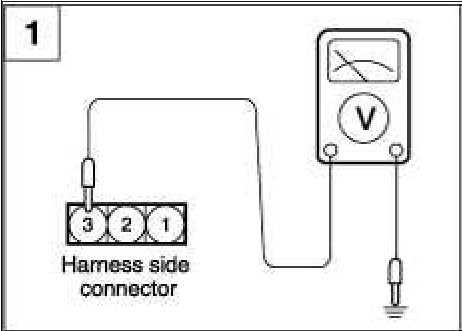
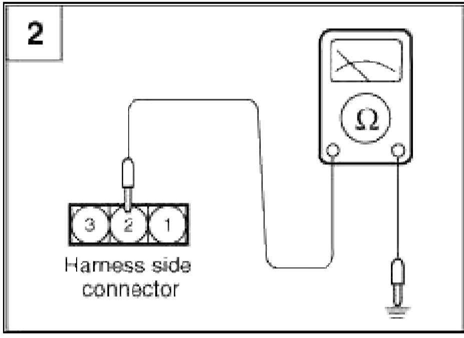
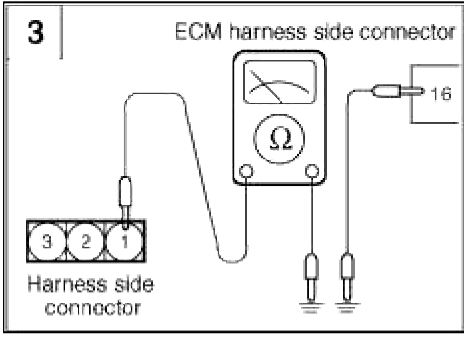
USING HI-SCAN

Check item	Data display	Check condition	Test specification
Throttle position sensor	Throttle angle	At idle rpm	5° ~ 16°
		Gradually open	Increases
		Wide open throttle	80° ~ 98°

USING VOLTMETER

Check item	Check condition	Test specification
Throttle position sensor output voltage (TP Sensor side connector No.1 or ECM harness side connector No.16)	At idle rpm	0.25 ~ 0.8V
	Wide open throttle	4.0 ~ 4.8V

HARNESS INSPECTION PROCEDURES

1		Measure the power supply voltage of the throttle position sensor. • Connector : Disconnected • Ignition switch : ON • Voltage : 4.8 ~ 5.2V	**OK** ⇨	**2**
			NG ⇨	Repair the harness.
2		Check for continuity of the ground circuit. • Connector : Disconnected	**OK** ⇨	**3**
			NG ⇨	Repair the harness.
3	 ECM harness side connector Ω 16 3 2 1 Harness side connector	Check for an open-circuit, or a short-circuit to ground between the engine control module and the throttle position sensor. • Throttle position sensor connector: Disconnected • Engine control module connector: Disconnected	**OK** ⇨	**END!**
			NG ⇨	Repair the harness.

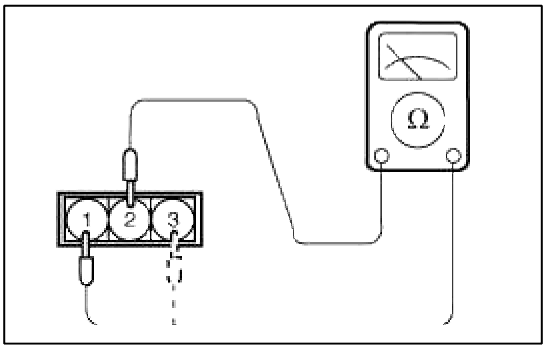
SENSOR INSPECTION

1. Disconnect the throttle position sensor connector.
2. Measure the resistance between terminals 2 (sensor ground) and terminal 3 (sensor power).

0.7 ~ 3.0 kΩ

3. Connect an analog ohmmeter between terminals 2 (sensor ground) and terminal 1 (sensor output).
4. Operate the throttle valve slowly from the idle position to the full open position, and check that the resistance changes smoothly in proportion with the throttle valve opening angle.
5. If the resistance is out of specification, or fails to change smoothly, replace the throttle position sensor.

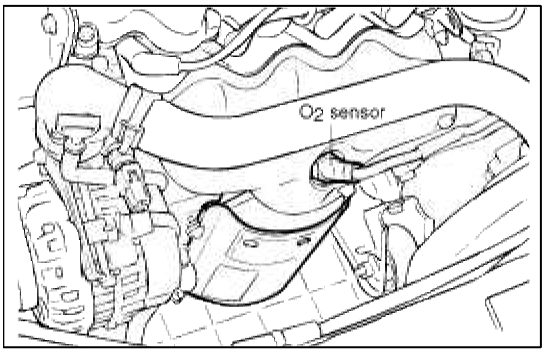
Tightening torque
Throttle position sensor :
1.5 ~ 2.5 Nm (15 ~ 25 kg·cm, 1.1 ~ 1.8 lb·ft)



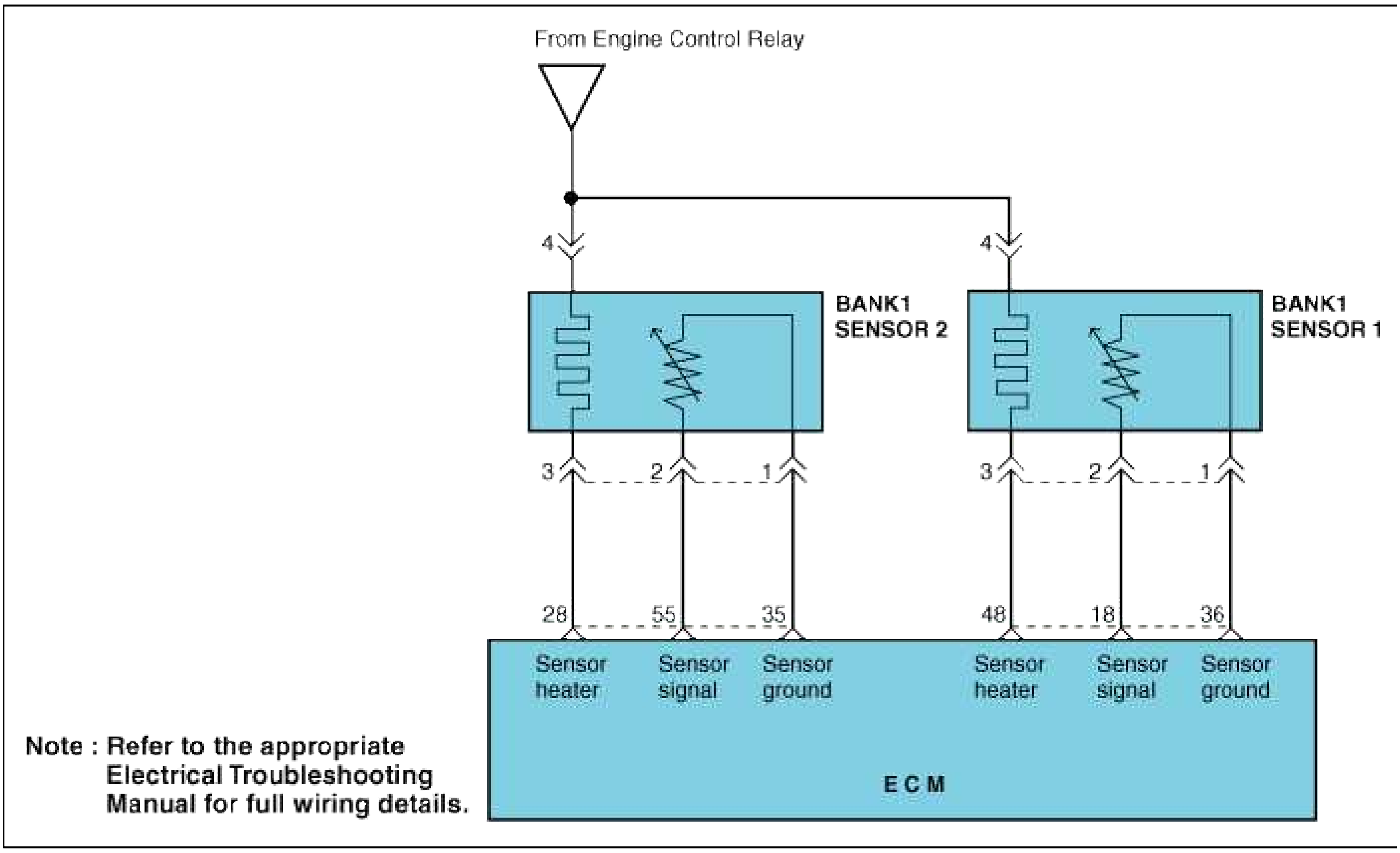
Fuel System > Engine Control System > Heated Oxygen Sensor (HO2S) > Troubleshooting

HEATED OXYGEN SENSOR (HO2S)

The heated oxygen sensor senses the oxygen concentration in the exhaust gas, then converts it into a voltage and then sends this to the ECM. The heated oxygen sensor gives an output of about 800mV when the air fuel ratio is richer than the theoretical ratio and output of about 100mV when the ratio is leaner (higher oxygen concentration in exhaust gas.) The ECM controls fuel injection based on this signal so that the air fuel ratio is maintained at the theoretical ratio.



CIRCUIT DIAGRAM


From Engine Control Relay
4
4
BANK1 SENSOR 2
BANK1 SENSOR 1
3
2
1
3
2
1
28
55
35
48
18
36
Sensor heater
Sensor signal
Sensor ground
Sensor heater
Sensor signal
Sensor ground
ECM
Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TROUBLESHOOTING HINTS

1. If the heated oxygen sensor is defective, abnormally high emissions may occur.
2. If the heated oxygen sensor check is normal but the sensor output voltage is out of specification, check for the following items related to the air fuel ratio control system :

- Faulty injector.
- Air leaks in the intake manifold.
- Faulty mass air flow sensor, purge valve and engine coolant temperature sensor.
- Wiring connection problem.

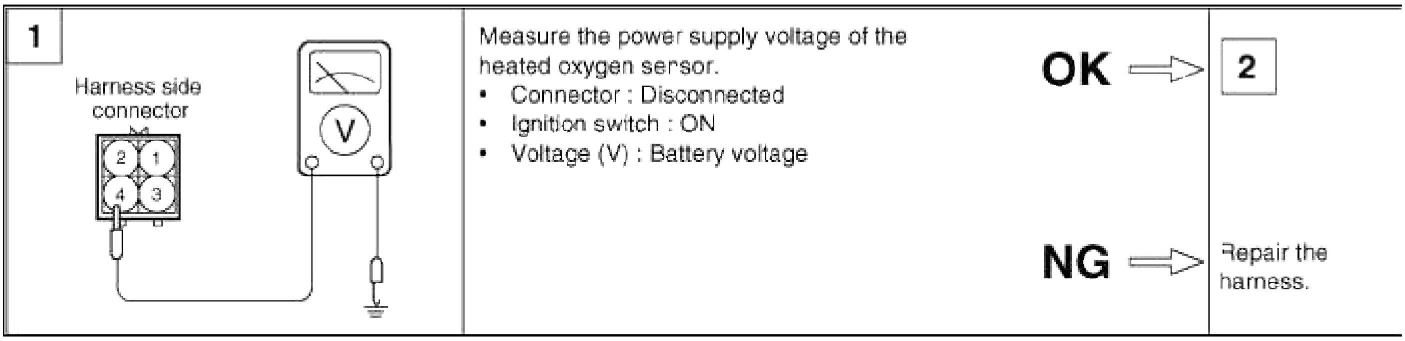
USING VOLTMETER/HI-SCAN

Check item	Check condition	Engine condition	Test specification
Heated oxygen sensor output voltage	Warm-up	When decelerating suddenly from 4000 rpm	A. 200mV or lower
		When engine is suddenly raced	B. 600 ~ 1000mV

NOTE

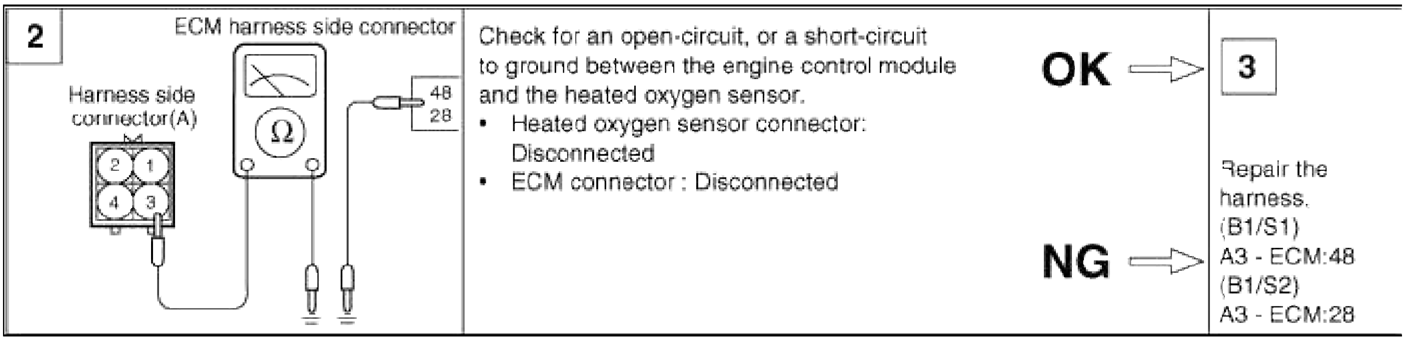
If you release the accelerator pedal suddenly after engine running about 4000 rpm, fuel supply will stop for short period and the O sensor service data in the HI-SCAN will display values in the A range.
When you suddenly press on the acclerator pedal down, the voltage will reach B range.
When you let the engine idle again, the voltage will fluctuate between ranges A and B. In this case, the O sensor can be determined as good.

HARNESS INSPECTION PROCEDURES


1
Harness side connector
2
1
4
3
V
OK
2
NG

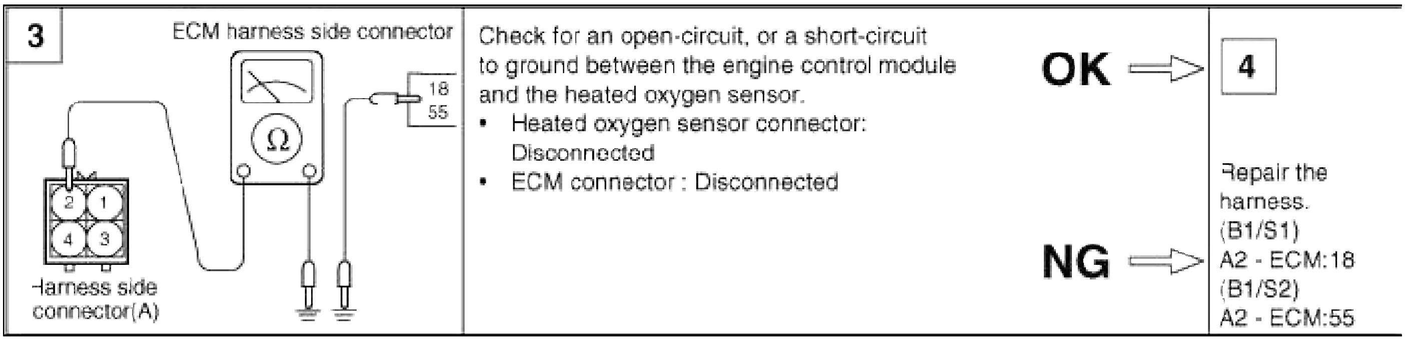
Measure the power supply voltage of the heated oxygen sensor.
- Connector : Disconnected
- Ignition switch : ON
- Voltage (V) : Battery voltage

Repair the harness.


2
ECM harness side connector
Harness side connector(A)
2
1
4
3
Ω
48
28
OK
3
NG

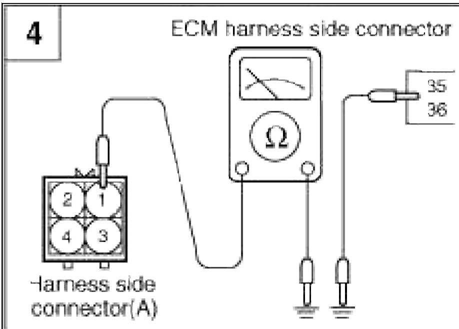
Check for an open-circuit, or a short-circuit to ground between the engine control module and the heated oxygen sensor.
- Heated oxygen sensor connector: Disconnected
- ECM connector : Disconnected

Repair the harness.
(B1/S1)
A3 - ECM:48
(B1/S2)
A3 - ECM:28


3
ECM harness side connector
Ω
18
55
2
1
4
3
Harness side connector(A)
OK
4
NG

Check for an open-circuit, or a short-circuit to ground between the engine control module and the heated oxygen sensor.
- Heated oxygen sensor connector: Disconnected
- ECM connector : Disconnected

Repair the harness.
(B1/S1)
A2 - ECM:18
(B1/S2)
A2 - ECM:55

4	 ECM harness side connector Ω 35 36 2 1 4 3 Harness side connector(A)	Check for continuity to ground circuit. • Connector : Disconnected	**OK** ⇨	**END!**
			NG ⇨	Repair the harness. (B1/S1) A1 - ECM:36 (B1/S2) A1 - ECM:35

SENSOR INSPECTION

NOTE

1. Before checking, warm up the engine until the engine coolant temperature reaches 80 to 95°C (176 to 205°F).
2. Use an accurate digital voltmeter.

Replace the oxygen sensor if there is a malfunction

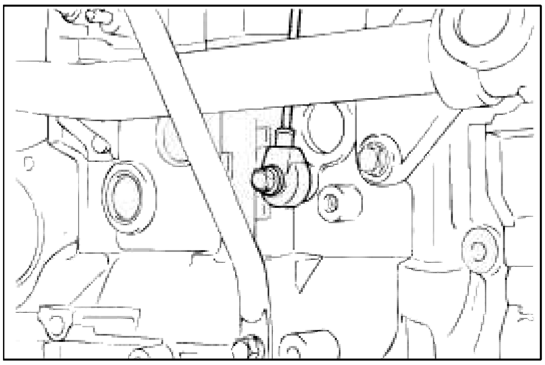
Tightening torque

Heated oxygen sensor :
50 ~ 60 Nm (500 ~ 600 kg·cm, 37 ~ 44 lb·ft)

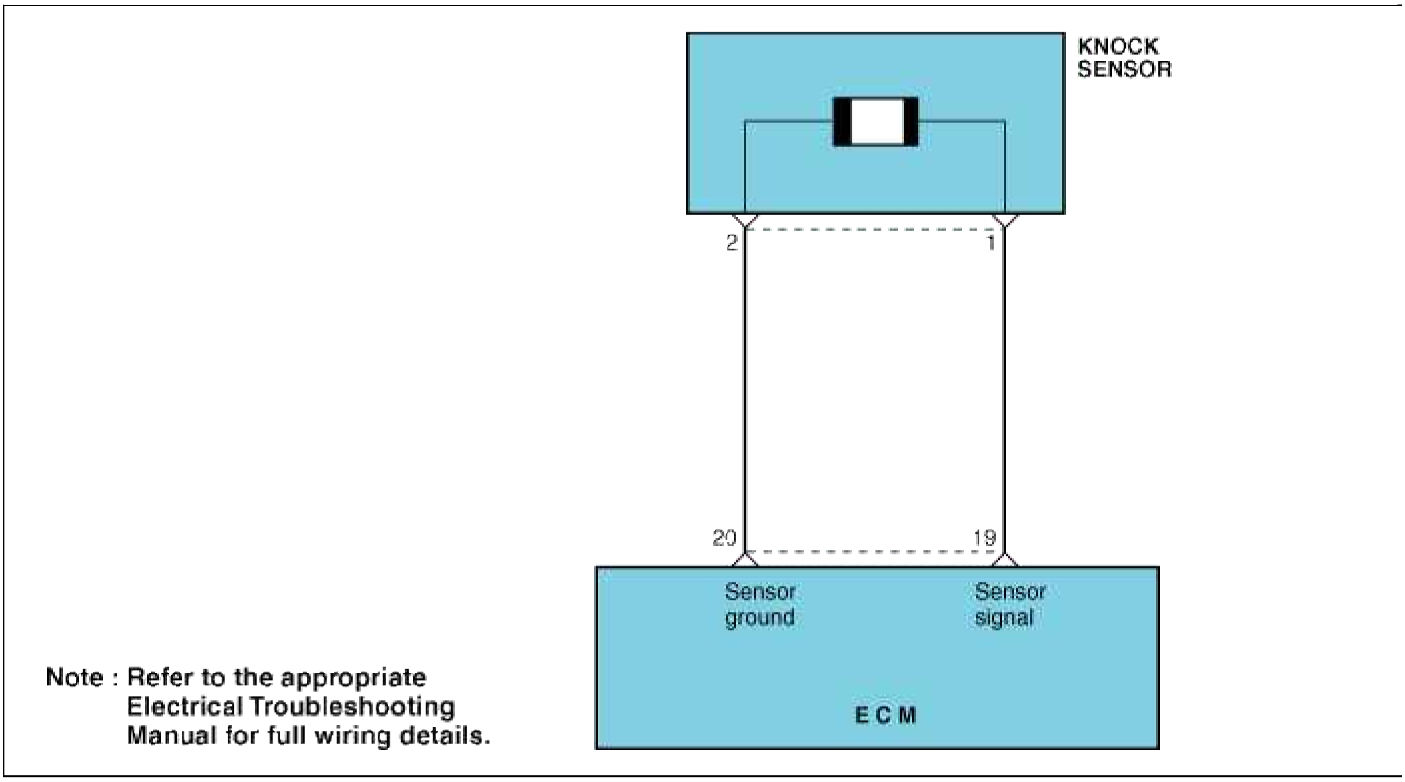
Fuel System > Engine Control System > Knock Sensor (KS) > Troubleshooting

KNOCK SENSOR

The knock sensor is attached to the side of the cylinder block to sense engine knocking. A knocking vibration from the cylinder block is applied as pressure to the piezoelectric element. This vibrational pressure is then converted into a voltage signal which is relayed to the ECM. If engine knocking occurs, ignition timing is retarded to suppress it.



CIRCUIT DIAGRAM


KNOCK SENSOR
2
1
20
19
Sensor ground
Sensor signal
E C M
Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

HARNESS INSPECTION PROCEDURE

SENSOR INSPECTION

1. Disconnect the knock sensor connector and measure resistance between terminals 1 and 2.

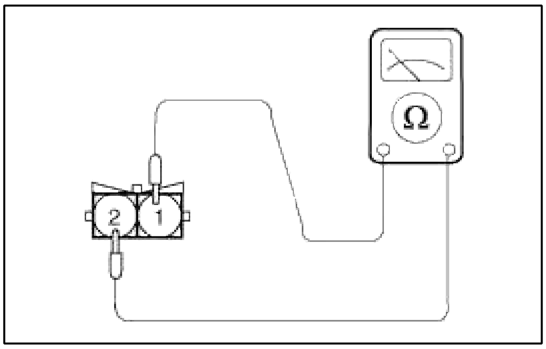
about 5MΩ [at 20°C (68°F)]

2. If the resistance is continuous, replace the knock sensor.

Tightening torque
Knock sensor :
16 ~ 25 Nm (160 ~ 250 kg·cm, 12 ~ 18 lb·ft)

3. Measure the capacitance between terminals 1 and 2.

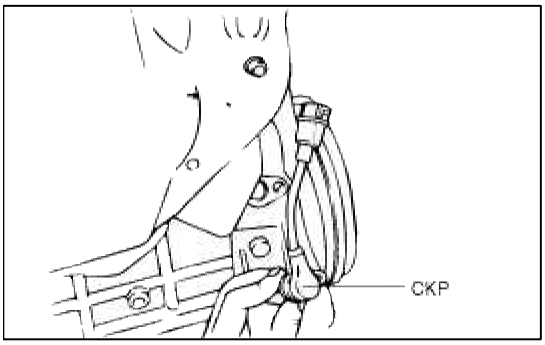
800 ~ 1600 pF



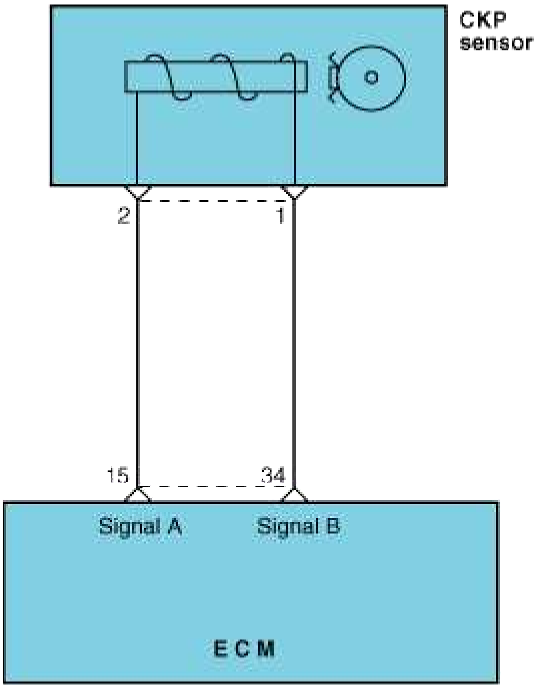
Fuel System > Engine Control System > Crankshaft Position Sensor (CKPS) > Troubleshooting

CRANKSHAFT POSITION SENSOR (CKP SENSOR)

The crankshaft position sensor, consisted of a magnet and coil, is located next to flywheel. The voltage signal from this crankshaft position sensor is relayed to the ECM to indicate engine RPM and the position of the crankshaft.

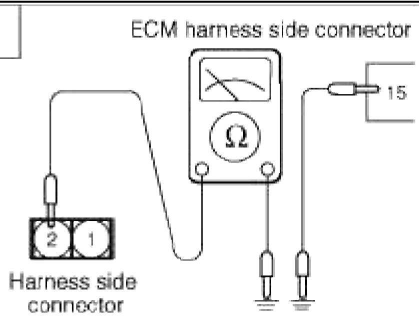


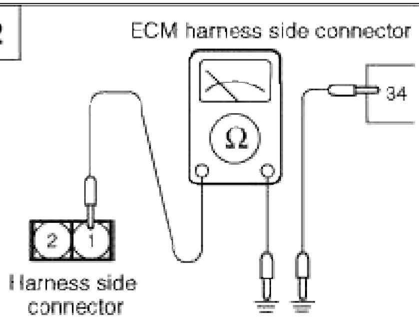
CIRCUIT DIAGRAM


CKP sensor
2
1
15
34
Signal A
Signal B
ECM

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

HARNESS INSPECTION PROCEDURES

1  ECM harness side connector 15 Ω 2 1 Harness side connector	Check for an open-circuit, or a short-circuit to ground between the ECM and the crankshaft position sensor. • ECM connector : Disconnected • Crankshaft position sensor connector: Disconnected	**OK** ⇨	2
		NG ⇨	Repair the harness.

2  ECM harness side connector 34 2 1 Harness side connector	Check for an open-circuit, or a short-circuit to ground between the ECM and the crankshaft position sensor. • ECM connector : Disconnected • Crankshaft position sensor connector: Disconnected	**OK** ⇨ **NG** ⇨	**END!** Repair the harness.

SENSOR INSPECTION

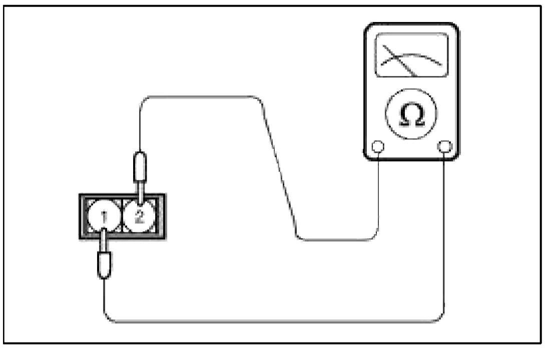
1. Disconnect the crankshaft position sensor connector.
2. Measure the resistance between terminals 1 and 2.

0.486 ~ 0.594kΩ at 20°C (68°F)

---

3. If the resistance deviates greatly from the standard value, replace the sensor.

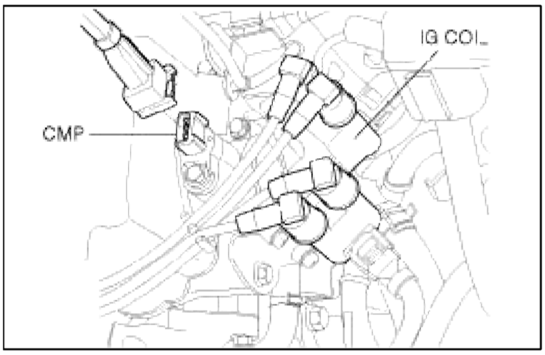
- **Standard value**
  Clearance between the crankshaft position sensor and crankshaft position sensor wheel : 0.5 ~ 1.5 mm (0.020 ~ 0.059 in.)
- **Tightening torque**
  Crankshaft position sensor :
  9 ~ 11 Nm (90 ~ 110 kg·cm, 7 ~ 8 lb·ft)



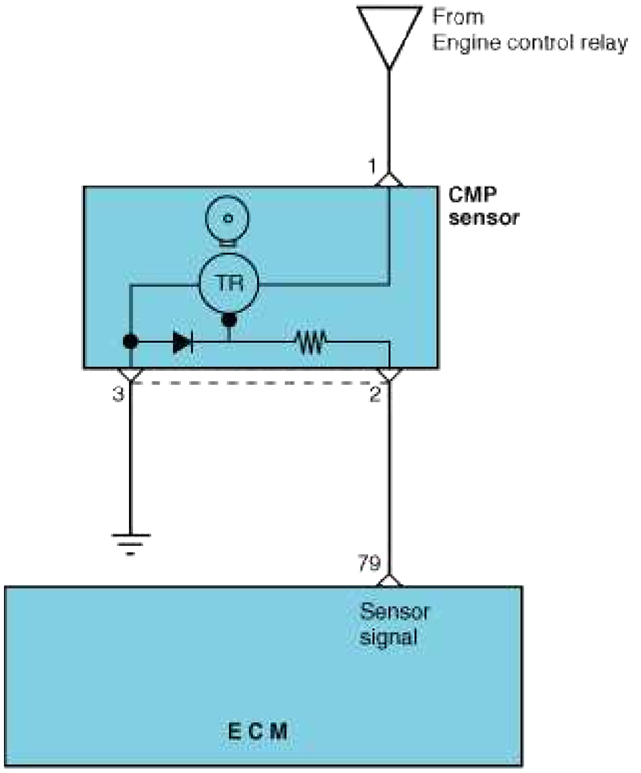
Fuel System > Engine Control System > Camshaft Position Sensor (CMPS) > Troubleshooting

CAMSHAFT POSITION SENSOR (CMP SENSOR)

The camshaft position sensor (CMP Sensor) senses the TDC point of No.1 cylinder on its compression stroke. Its signal is fed to the ECM to be used to determine the sequence of fuel injection.



CIRCUIT DIAGRAM


From
Engine control relay
1
CMP
sensor
TR
3
2
79
Sensor
signal
E C M

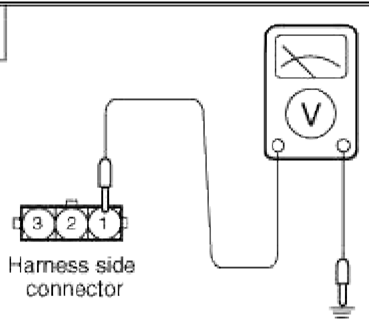
Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

USING VOLTMETER

Check item	Check condition	Test specification
Camshaft position sensor output voltage	At idle rpm	0 ~ B+ (5 ~ 8 Hz)
	3000 rpm	0 ~ B+ (24 ~ 26 Hz)

HARNESS INSPECTION PROCEDURES

1


3
2
1
V
Harness side
connector

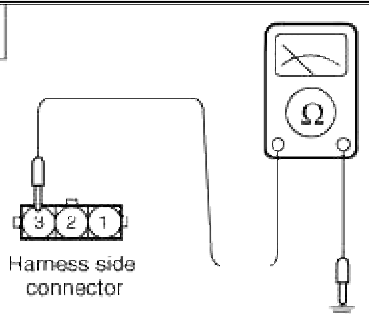
Measure the power supply voltage.

- Connector : Disconnected
- Ignition switch : ON
- Voltage (V) : Battery voltage

OK ⇨ **2**

NG ⇨ Repair the harness.

2

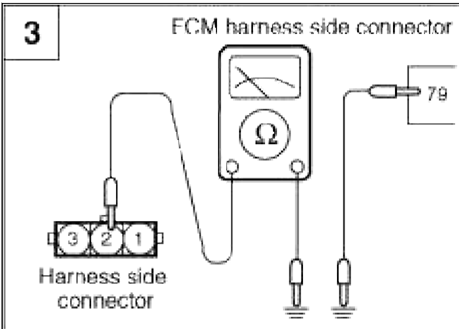

3
2
1
Ω
Harness side
connector

Check for continuity of the ground circuit.

- Connector : Disconnected

OK ⇨ **3**

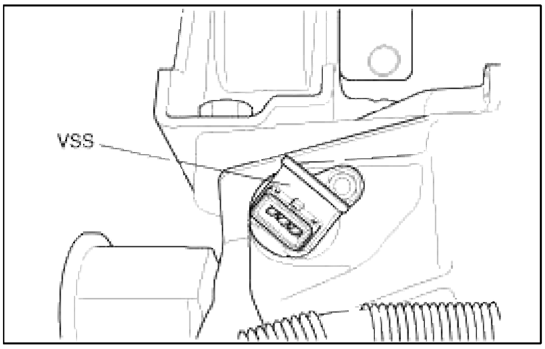
NG ⇨ Repair the harness.

3  ECM harness side connector Ω 79 3 2 1 Harness side connector	Check for an open-circuit, or a short-circuit to ground between the engine control module and the camshaft position sensor. • Camshaft position sensor connector: Disconnected • Engine control module connector: Disconnected	**OK** ⇨ **NG** ⇨	**END!** Repair the harness.

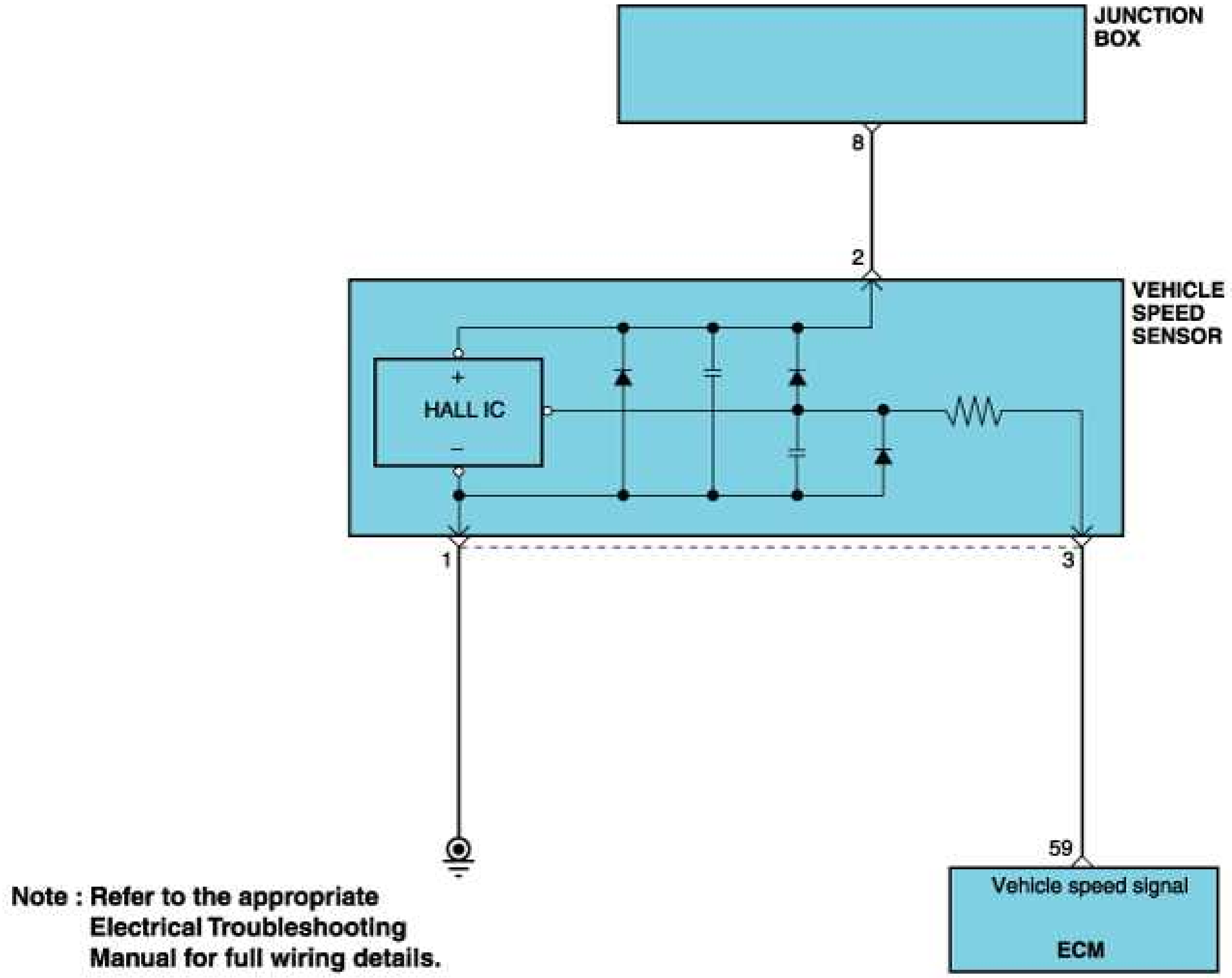
Fuel System > Engine Control System > Vehicle Speed Sensor (VSS) > Troubleshooting

VEHICLE SPEED SENSOR

The vehicle speed sensor is a hall effect sensor that is attached on the output shaft of transaxle. The sensor converts the transaxle gear revolutions into a pulse signal which is sent to the ECM.



CIRCUIT DIAGRAM

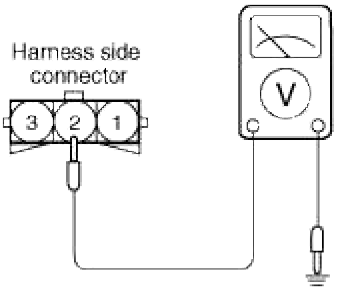
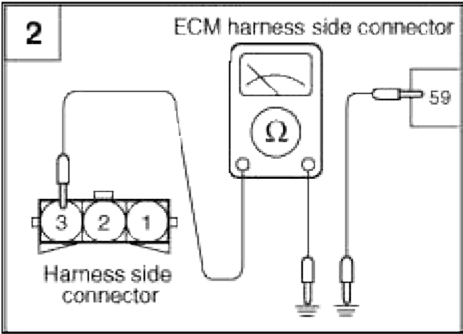

JUNCTION BOX
8
2
VEHICLE SPEED SENSOR
+
HALL IC
–
1
3
59
Vehicle speed signal
ECM

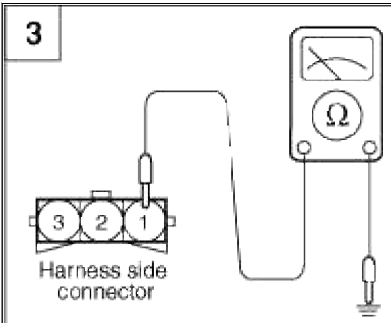
Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TROUBLESHOOTING HINTS

If there is an open or short circuit in the vehicle speed sensor signal circuit,the engine may stall when the vehicle decelerates to a stop.

HARNESS INSPECTION PROCEDURES

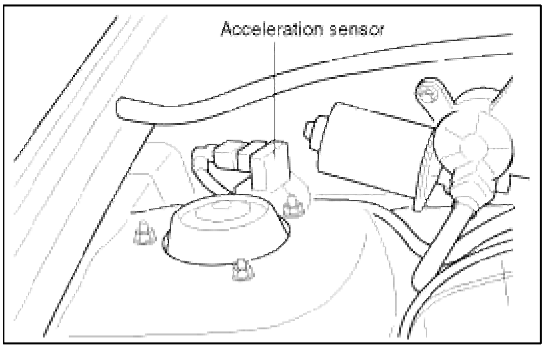
1	 Harness side connector 3 2 1 V	Measure the power supply voltage of the VSS. • Connector : Disconnected • Ignition switch : ON • Voltage (V) : Battery voltage	**OK** ⇨ **NG** ⇨	2 Repair the harness.
2	 ECM harness side connector 59 Ω 3 2 1 Harness side connector	Check for an open-circuit, or a short-circuit to ground between the ECM and the VSS. • ECM connector : Disconnected • VSS connector : Disconnected	**OK** ⇨ **NG** ⇨	3 Repair the harness.

3  3 2 1 Harness side connector Ω	Check for an open-circuit between VSS and ground. • VSS connector : Disconnected	**OK** ⇨ **NG** ⇨	**END!** Repair the harness.

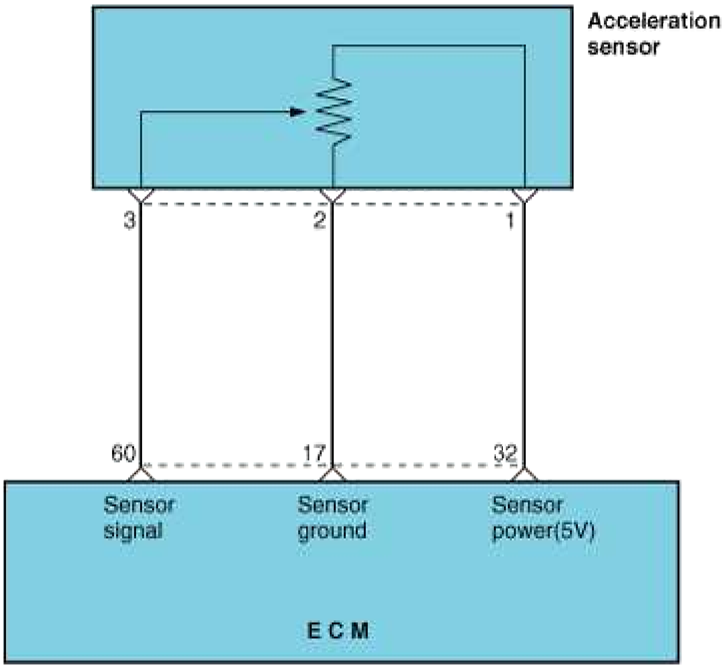
Fuel System > Engine Control System > Acceleration Sensor > Troubleshooting

ACCELERATION SENSOR

The acceleration sensor is used to sense rough road conditions. The sensor's signal is used by the Engine Control Module (ECM) to prevent wrongful misfire detection.


Acceleration sensor

CIRCUIT DIAGRAM

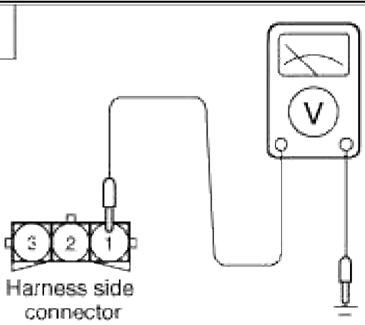
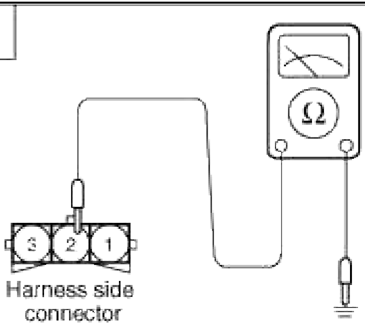
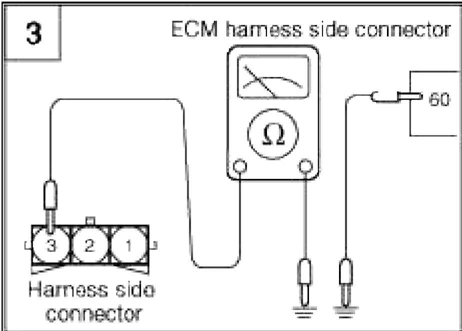

Acceleration sensor
3
2
1
60
17
32
Sensor signal
Sensor ground
Sensor power(5V)
E C M

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

USING VOLTMETER

Check item	Check condition	Test specification
Acceleration sensor output voltage	While idling	2.3 ~ 2.7V
	IG. OFF	0V

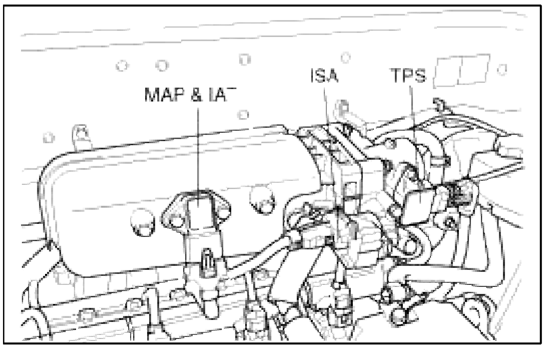
HARNESS INSPECTION PROCEDURES

1  V 3 2 1 Harness side connector	Measure the sensor voltage(5V) of the acceleration sensor. o Sensor connector : Disconnected o ECM connector : Connected	**OK** ⇨ **NG** ⇨	2 Repair the harness.
2  Ω 3 2 1 Harness side connector	Check for continuity of the ground circuit. • Connector : Disconnected	**OK** ⇨ **NG** ⇨	3 Repair the harness.
3  ECM harness side connector Ω 60 3 2 1 Harness side connector	Check for an open-circuit, or a short-circuit to ground between the ECM and the acceleration sensor. • Acceleration sensor connector : Disconnected • Engine control module connector Disconnected	**OK** ⇨ **NG** ⇨	**END!** Repair the harness.

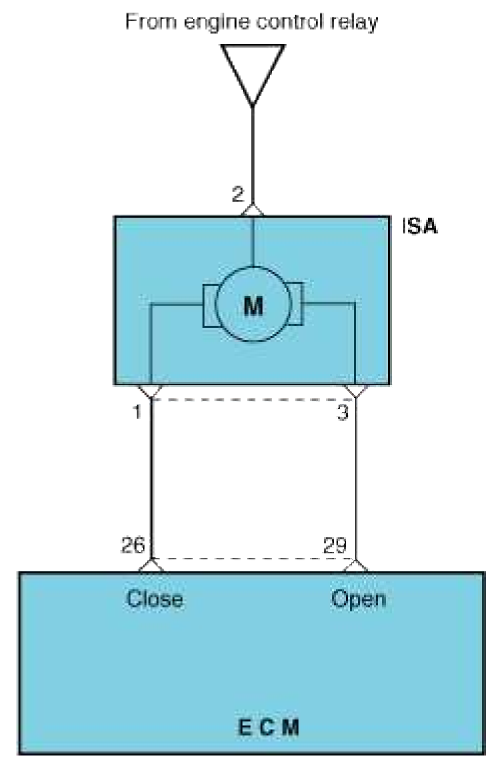
Fuel System > Engine Control System > Idle Speed Control Actuator (InodeA) > Troubleshooting

IDLE SPEED CONTROL ACTUATOR (ISC ACTUATOR)

The idle speed actuator is a double coil type driven by separate driver stages in the ECM. Depending on the pulse duty factor, the equilibrium of the magnetic forces of the two coils will result in different angles of the motor. A bypass hose line is positioned, in parallel to the throttle valve where the idle speed actuator is inserted.


MAP & IAT
ISA
TPS

CIRCUIT DIAGRAM


From engine control relay
2
ISA
M
1
3
26
29
Close
Open
E C M

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TROUBLESHOOTING HINTS

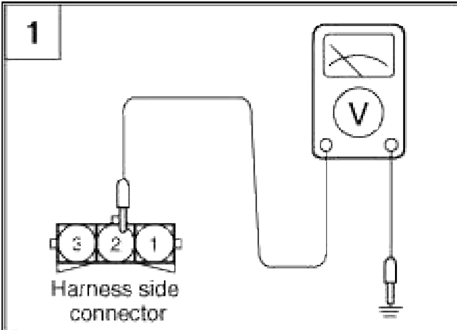
Open or short circuit is observed in idle air control system when ignition switch is turned on.

USING HI-SCAN

Check item	Check condition	Engine condition	Test specification
Idle speed control actuator • Actuator test	Start the engine	ISCV	Activate

HARNESS INSPECTION PROCEDURES

1

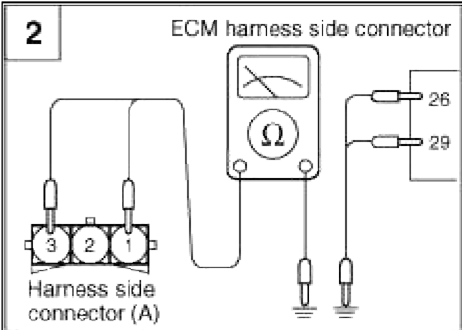

V
3
2
1
Harness side connector

Measure the power supply voltage of the injector.
- Connector : Disconnected
- Ignition switch : ON
- Voltage (V) : Battery voltage

OK ⇨ 2

NG ⇨ Repair the harness.

2


ECM harness side connector
Ω
26
29
3
2
1
Harness side connector (A)

Check for an open-circuit, or a short-circuit to ground between the ECM and the idle speed control actuator.
- ECM connector : Disconnected
- Idle speed actuator connector: Disconnected

OK ⇨ **END!**

NG ⇨ Repair the harness.
A1 - ECM:26
A3 - ECM:29

ACTUATOR INSPECTION

RESISTANCE MEASUREMENT BETWEEN TERMINALS

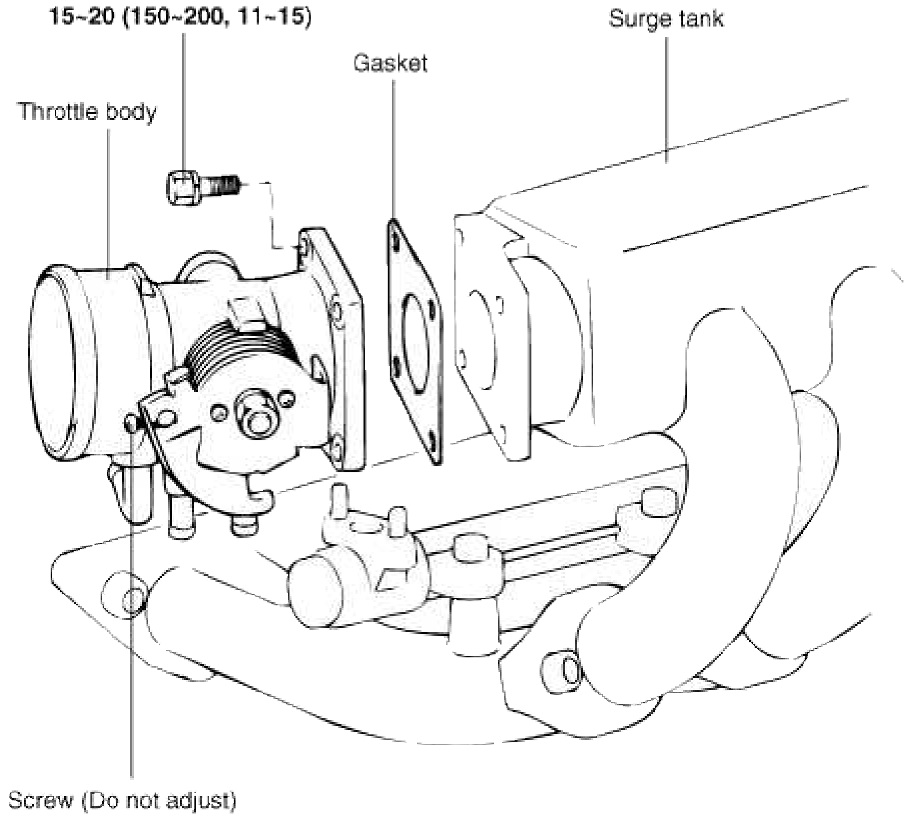
1. Disconnect the connector at the idle speed control actuator.
2. Measure the resistance between terminals.

Standard value
Terminal 1 and 2 : 10.5 ~ 14Ω
Terminal 2 and 3 : 10 ~ 12.5Ω [at 20°C (68°F)]

3. Connect the connector to the idle speed control actuator.

Fuel System > Engine Control System > Throttle Body > Components and Components Location

COMPONENTS


15~20 (150~200, 11~15)
Surge tank
Gasket
Throttle body
Screw (Do not adjust)

TORQUE : Nm (kg·cm, lb·ft)

Fuel System > Engine Control System > Throttle Body > Repair procedures

REMOVAL

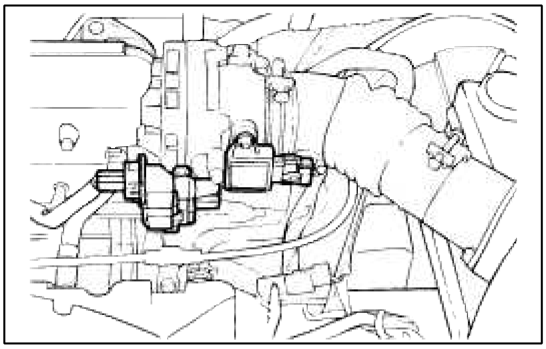
CAUTION

The throttle valve must not be removed.

Remove the throttle position sensor.

NOTE

Except when necessary for replacement, the throttle position sensor must not be removed.

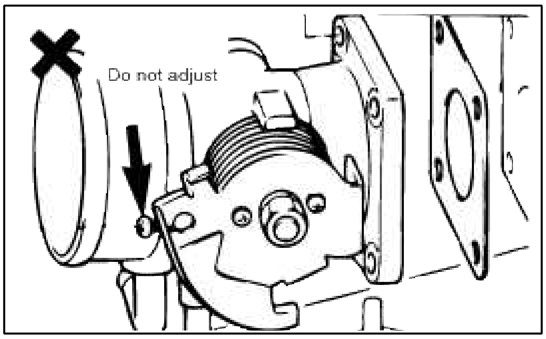


INSPECTION

1. Check the throttle body for cracks.
2. Check for restriction in the vacuum port or passage.
3. Check for interference when moving the accelerator cable.

CAUTION

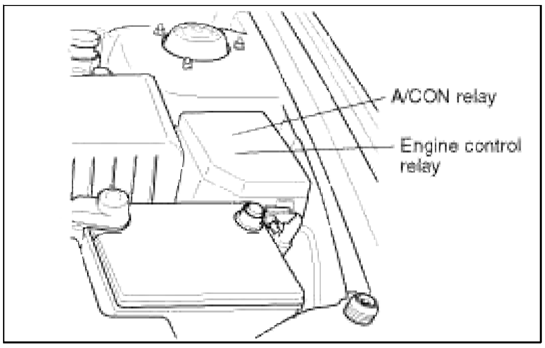
- Throttle valve set screw was adjusted in the production line with the air volume (0.516 ± 5% g/sec) during idling. So please DO NOT ADJUST IT voluntarily.
- When the idle rpm is out of specification, check the relevant sensors and their input or output value first.
- The throttle body does not need to be cleaned because carbon in throttle body does not affect the system's operation at all.



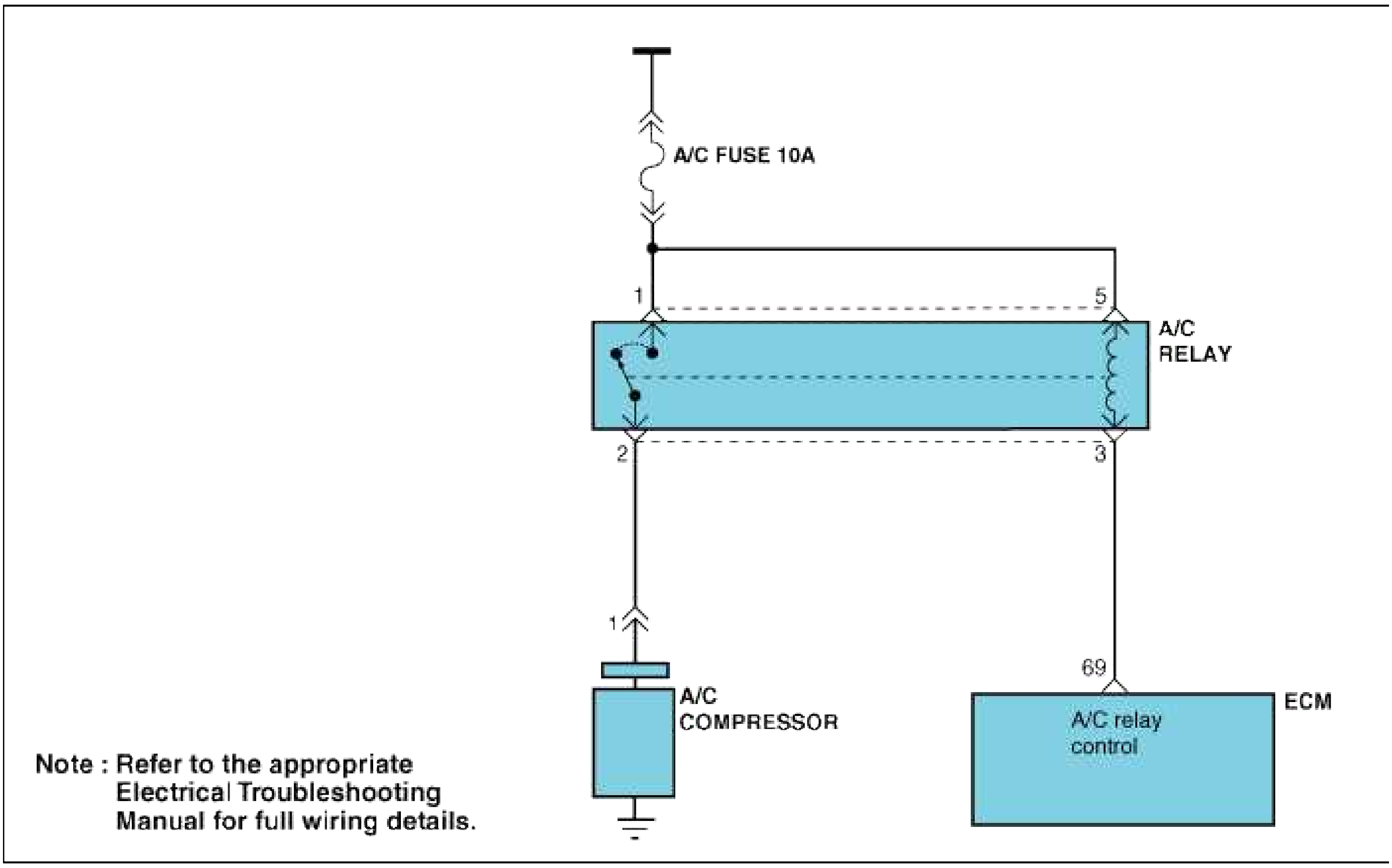
Fuel System > Engine Control System > A/C Switch and Relay > Troubleshooting

AIR CONDITIONING SWITCH AND RELAY

The air conditioning switch relays battery voltage to the ECM when the air conditioning is turned on. When the air conditioning ON signal is input, the ECM drives the ISC Actuator and turns ON the ignition power transistor. Then, the air conditioning power relay coil is energized to turn on the relay switch, which activates the compressor magnetic clutch.


A/CON relay
Engine control relay

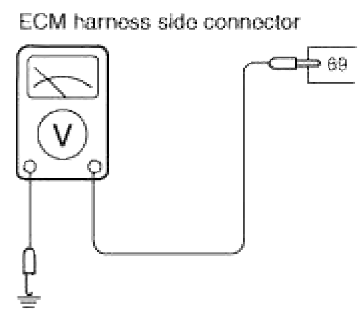
CIRCUIT DIAGRAM


A/C FUSE 10A
1
5
A/C RELAY
2
3
1
69
A/C COMPRESSOR
ECM
A/C relay control
Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

USING HI-SCAN

Check item	Data display	Check condition	Air conditioning switch	Normal indicator
Air conditioning switch	Switch state (ON/OFF)	Engine : Idling (air compressor is running when air conditioning switch is ON)	OFF	OFF
			ON	ON
Air conditioning compressor	Air conditioning compressor	Engine : Idling after warm-up	OFF	OFF (compressor clutch non-activation)
			ON	ON

HARNESS INSPECTION

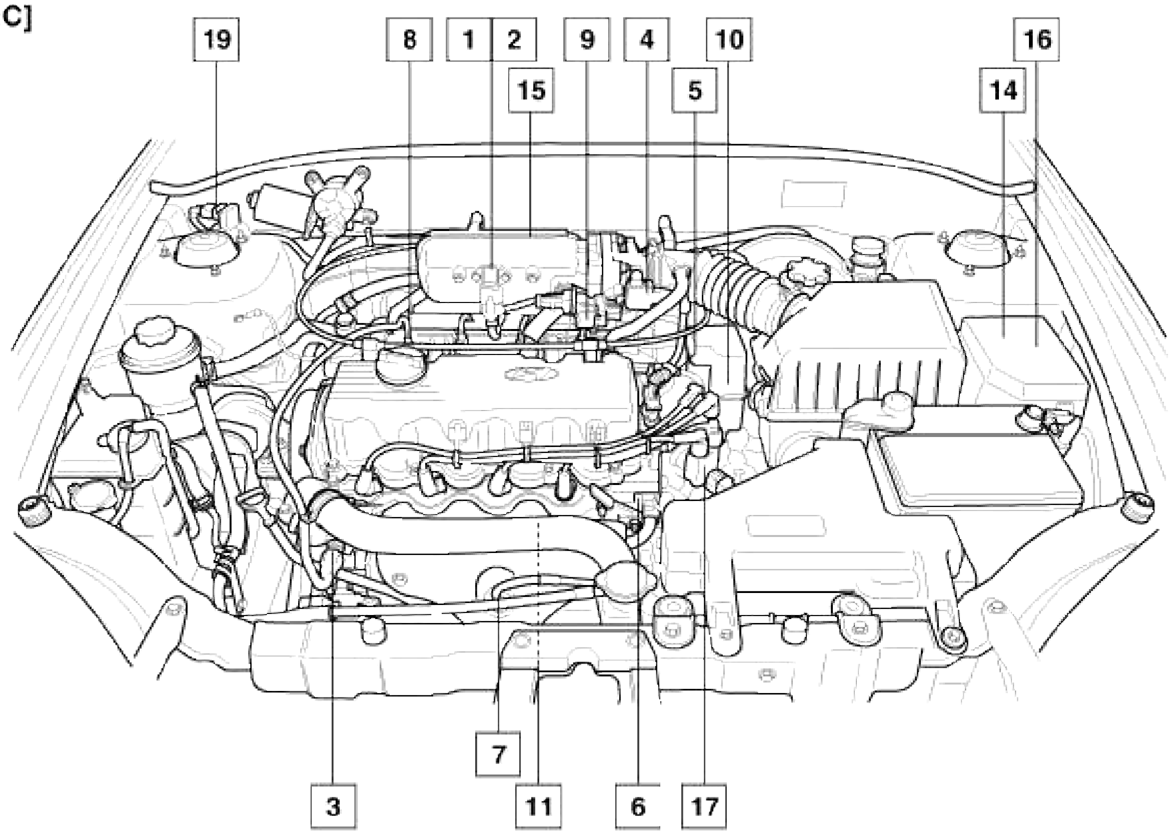
 ECM harness side connector	Measure the power supply voltage of the air condition circuit. • Air condition switch : ON • Engine control unit connector: Disconnected • Ignition switch : ON • Voltage : Battery voltage	**OK** ⇨ **NG** ⇨	**END!** Check the air conditioning circuit

AIR CONDITIONING INSPECTION
Refer to GROUP-HA service adjustment procedures.

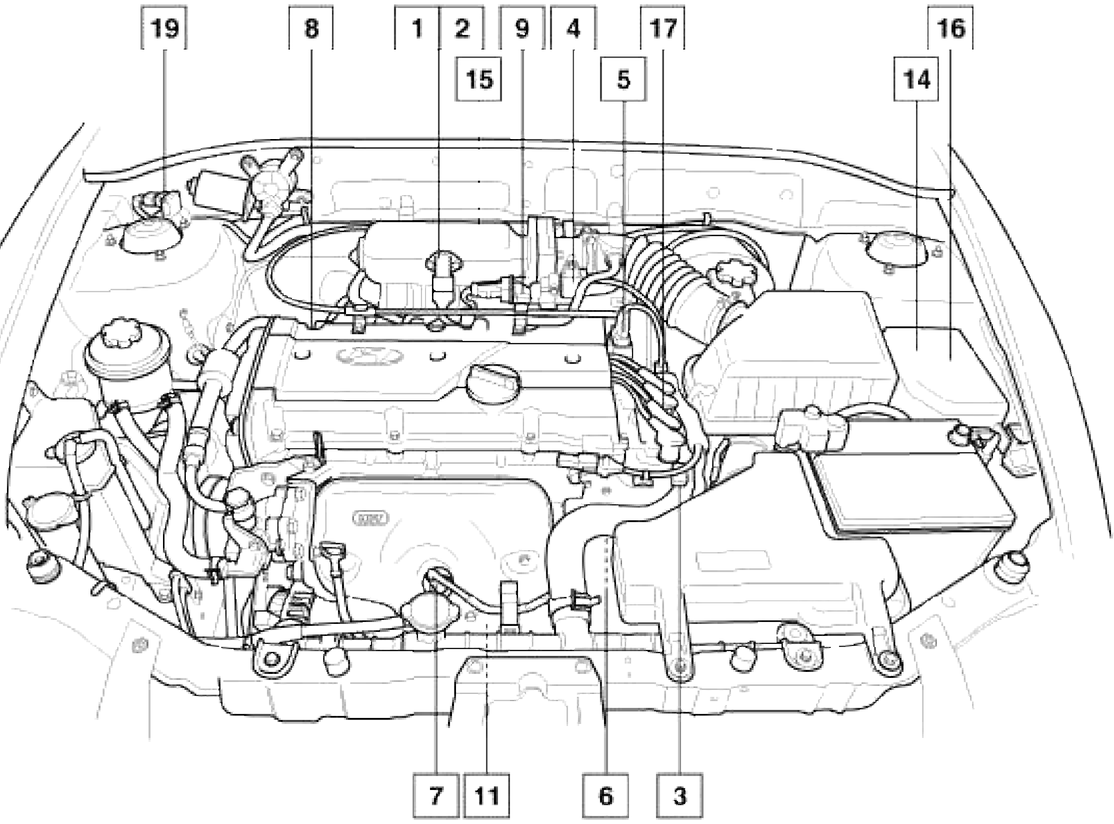
Fuel System > Engine Control System > Components and Components Location

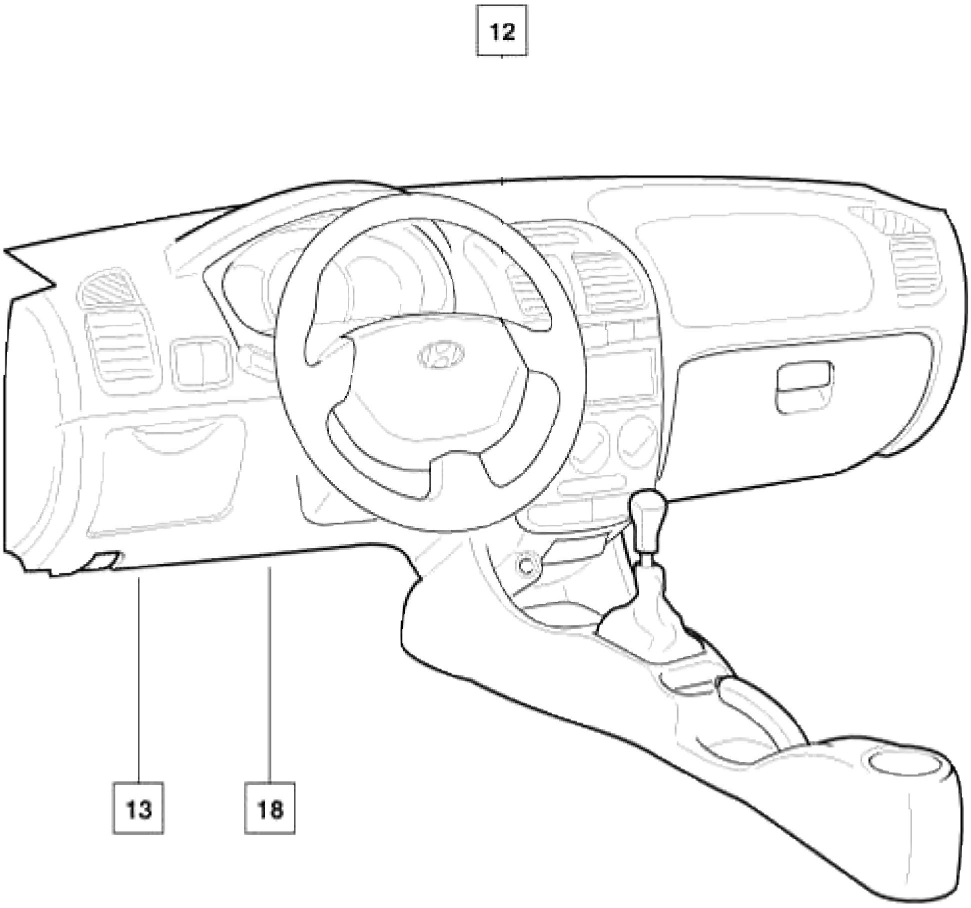
COMPONENTS

[SOHC]


19
8
1
2
9
4
10
16
15
5
14
7
3
11
6
17

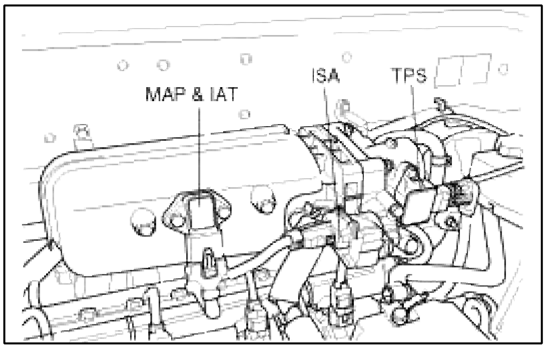
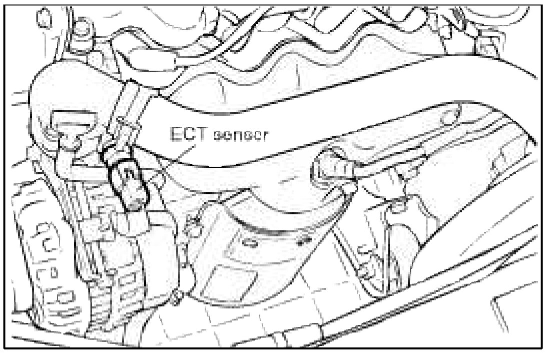
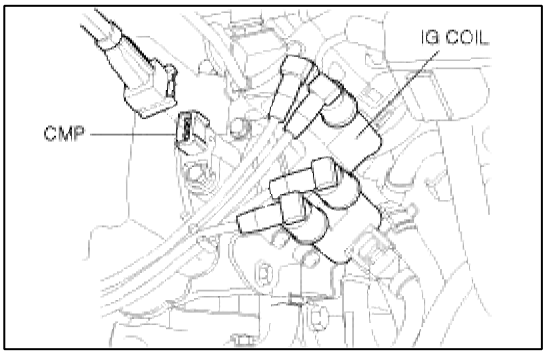
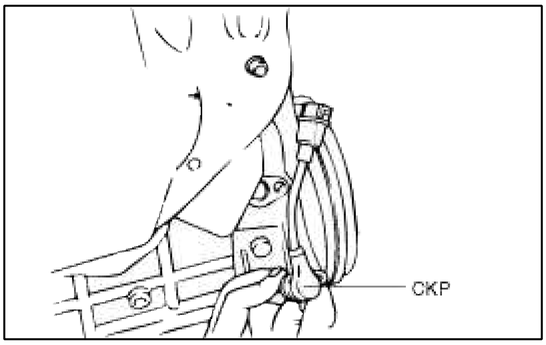
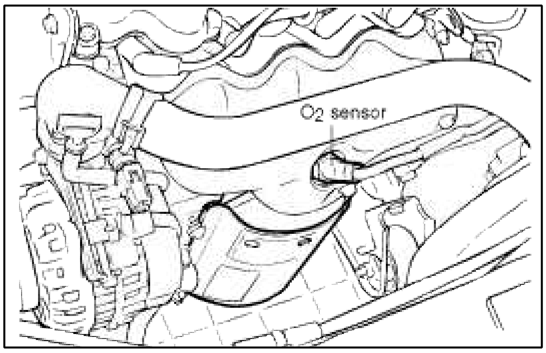
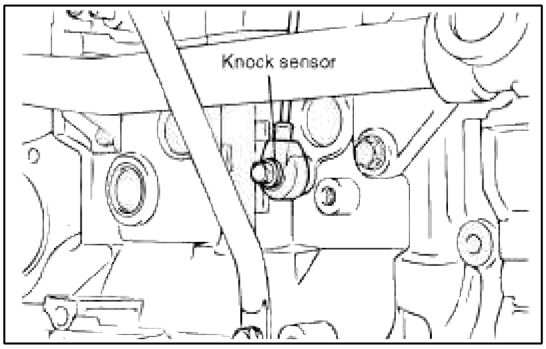
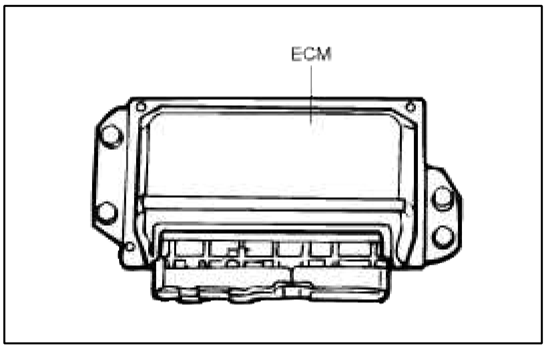
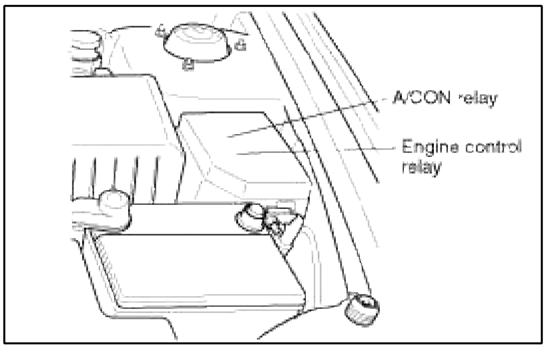
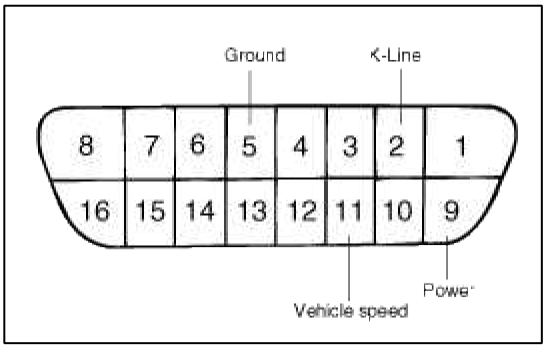
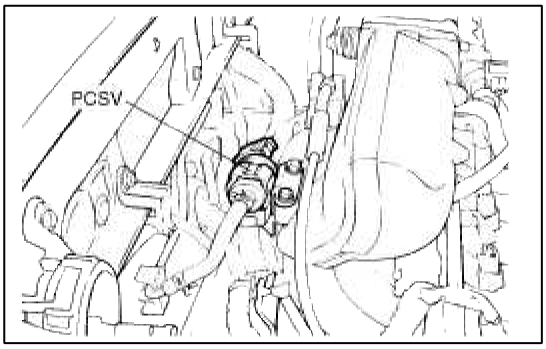
[DOHC]

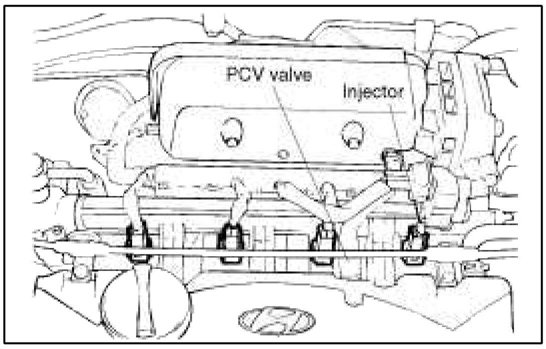
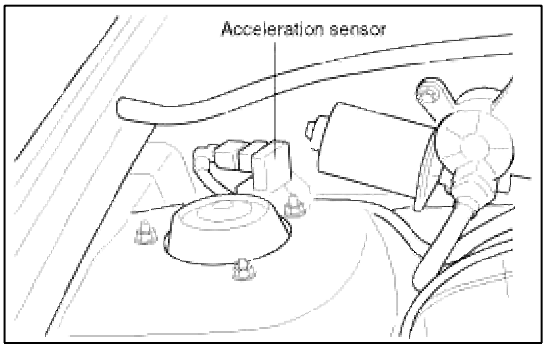
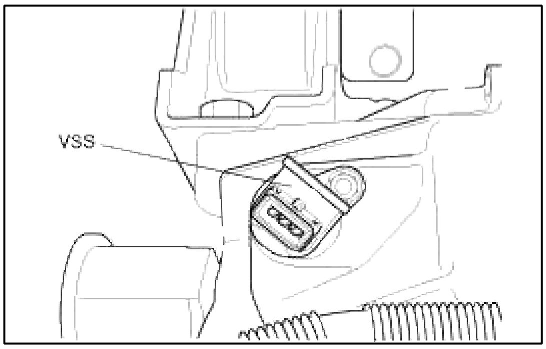

19
8
1
2
9
4
17
16
15
5
14
7
11
6
3



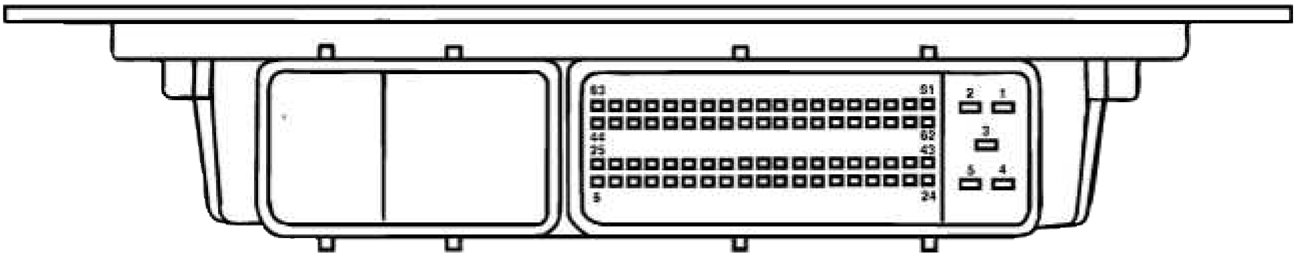
1	Manifold Absolute Pressure (MAP) Sensor	11	Knock sensor
2	Intake Air Temperature (IAT) Sensor	12	Ignition switch
3	Engine Coolant Temperature (ECT) Sensor	13	Engine Control Module (ECM)
4	Throttle Position Sensor (TPS)	14	A/CON Relay
5	Camshaft Position (CMP) Sensor	15	Purge Control Solenoid Valve (PCSV)
6	Crankshaft Position (CKP) Sensor	16	MFI control relay
7	Heated Oxygen Sensor (HO2S)	17	Ignition coil
8	Injector	18	Data link connector
9	Idle Speed Actuator (ISA)	19	Acceleration sensor
10	Vehicle speed sensor (VSS)		

[1], [2], [4], [9]	**[3]**

 MAP & IAT ISA TPS	
[5], [17]	**[6]**
	
[7]	**[11]**
	 Knock sensor
[13]	**[14], [16]**
	 A/CON relay Engine control relay
[18]	**[15]**
 Ground K-Line 8 7 6 5 4 3 2 1 16 15 14 13 12 11 10 9 Power Vehicle speed	

[8]	**[19]**
 PCV valve Injector	 Acceleration sensor
[10]	
 	

ECM PIN NUMBER CONFIGURATION

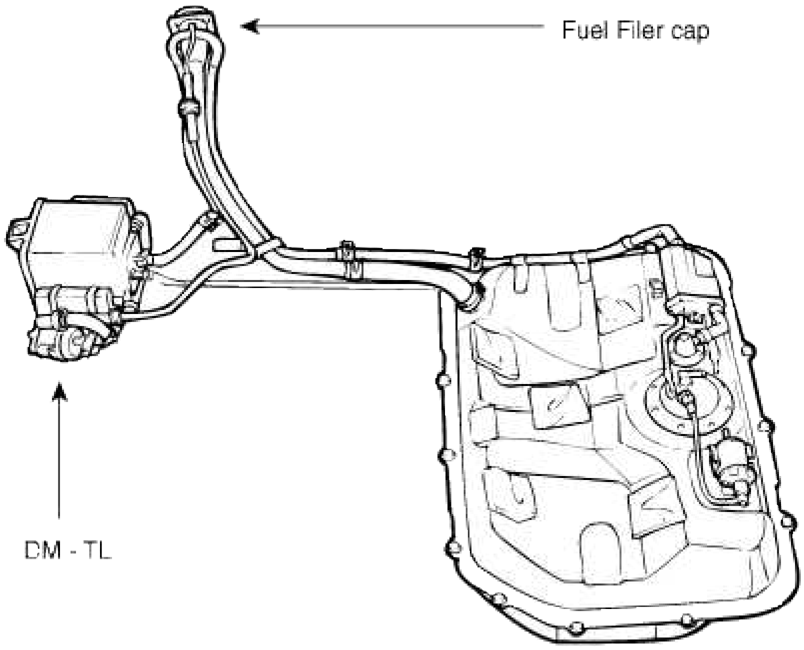

63
81
44
62
25
43
6
24
2
1
3
5
4

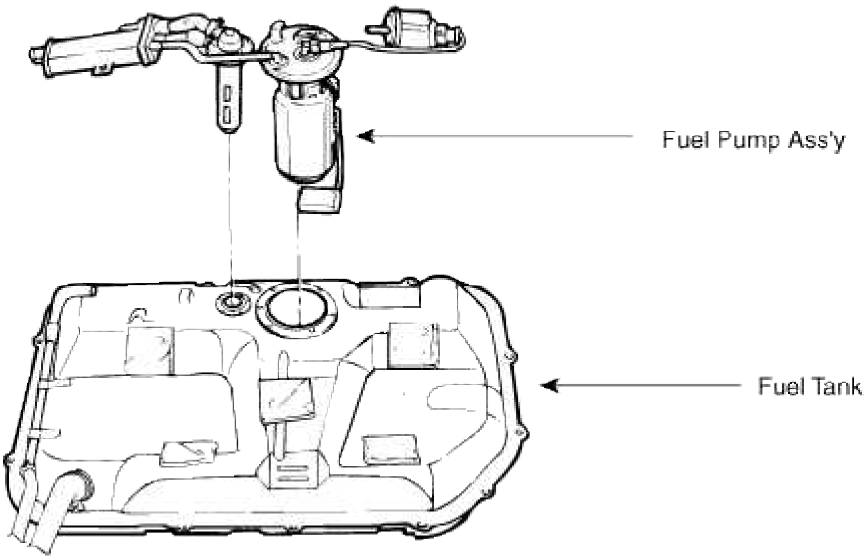
ECM HARNESS PIN NUMBER CONFIGURATION

1	2	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63
3		62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44
		43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
4	5	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6

Fuel System > Fuel Delivery System > Fuel Tank > Components and Components Location

COMPONENTS

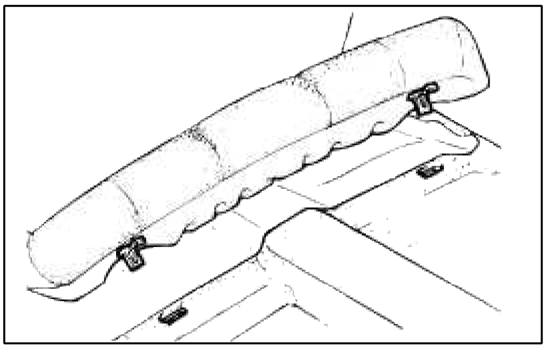

Fuel Filer cap
DM - TL


Fuel Pump Ass'y
Fuel Tank

Fuel System > Fuel Delivery System > Fuel Tank > Repair procedures

REMOVAL

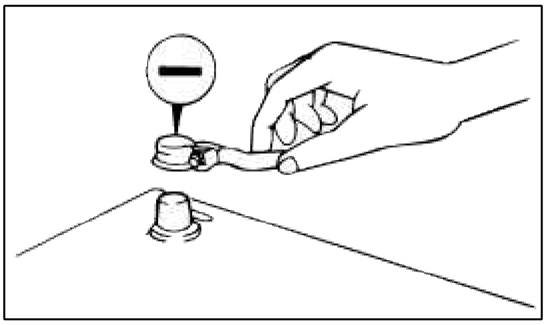
1. Press the two taps under the rear seat and raise the seat, then detach the inspection panel of the fuel pump.



2. To reduce the internal pressure of the fuel lines and hoses, first start the engine with the fuel pump disconnected and wait until it stops by itself.

> **NOTE**
>
> Be sure to reduce the fuel pressure before disconnecting the fuel main pipe and hose, otherwise fuel will spill out.

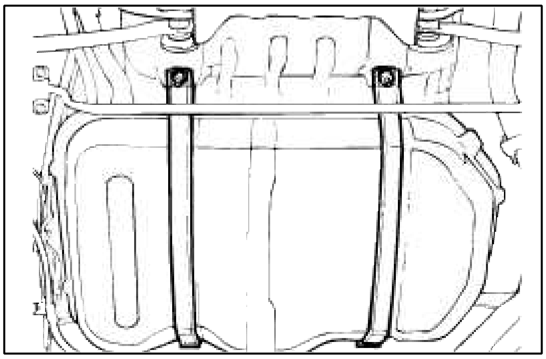
3. Disconnect the battery cable from the negative terminal of the battery.



4. Disconnect the high pressure hose from the fuel filter output side, and disconnect the tap for static electricity.

> **CAUTION**
>
> Cover the hose connection with a shop tower to prevent splashing of fuel that could be caused by residual pressure in the fuel line.

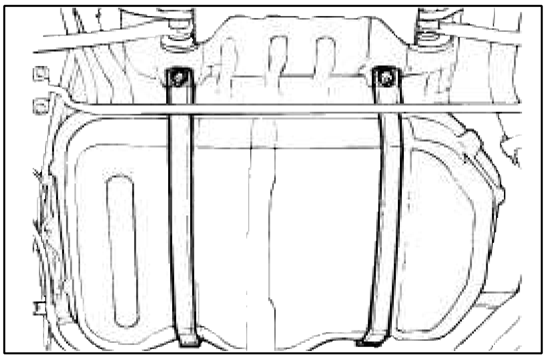
5. Lift up the vehicle.
6. Detach the fuel filler hose and leveling hose.
7. Support the fuel tank with a jack.
8. Remove the fuel tank bands.



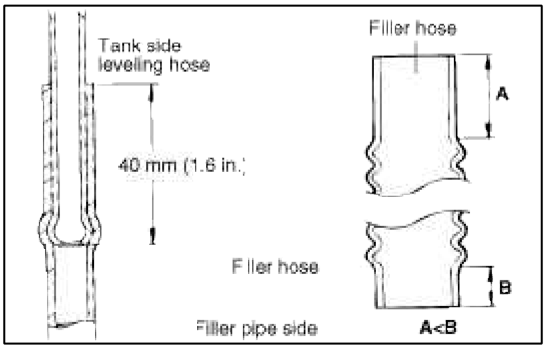
9. Remove the fuel tank.

INSTALLATION

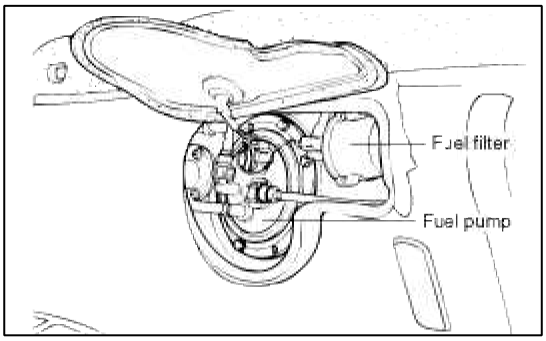
1. Confirm that the pad is fully bonded to the fuel tank, and install the fuel tank by tightening the self-locking nuts.



2. Connect the leveling hose to the tank and at the filler neck by approximately 40mm (1.6 in.).
3. When connecting the filler hose, the end with the shorter straight pipe should be connected to the tank side.

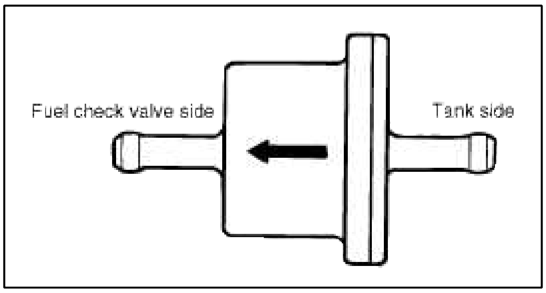

Tank side
leveling hose
40 mm (1.6 in.)
Filler hose
Filler pipe side
Filler hose
A
B
A<B

4. Connect the vapor hose. When attaching the vapor hose to the line, be sure that the hose is attached as shown in the illustration.
5. Connect the high pressure hose to the fuel pump. Be careful that the fuel hose does not twist.
6. Connect the electrical fuel pump connector.


Fuel filter
Fuel pump

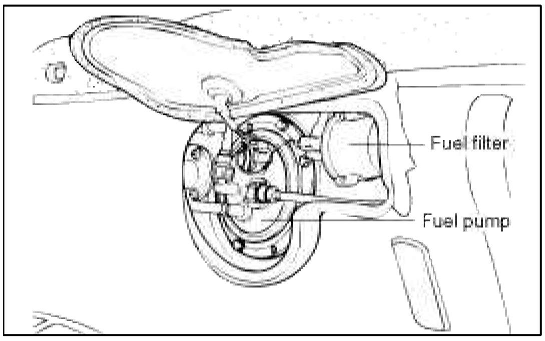
INSPECTION

1. Check the hoses and the pipes for cracks or damage.
2. Check the fuel tank cap for proper operation.
3. Check the fuel tank for deformation, corrosion or cracking.
4. Check the inside of the fuel tank for dirt or foreign material.
5. Check the in-tank fuel filter for damage or restriction.
6. Test the two-way valve for proper operation
7. To check the two-way valve, lightly blow into the inlet and outlet. If air passes through after slight resistance, then the valve is good.

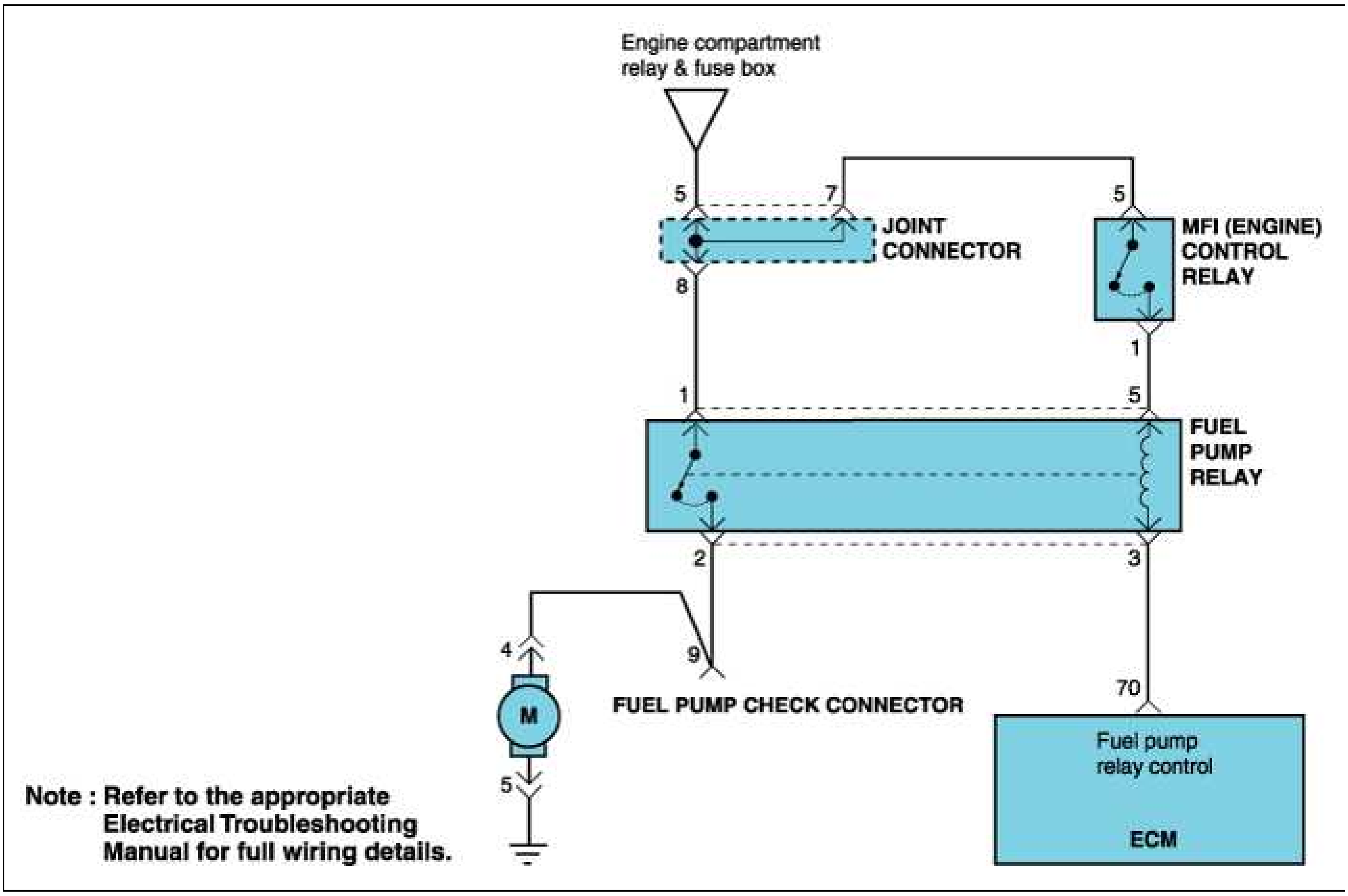

Fuel check valve side
Tank side

Fuel System > Fuel Delivery System > Fuel Pump > Troubleshooting

FUEL PUMP

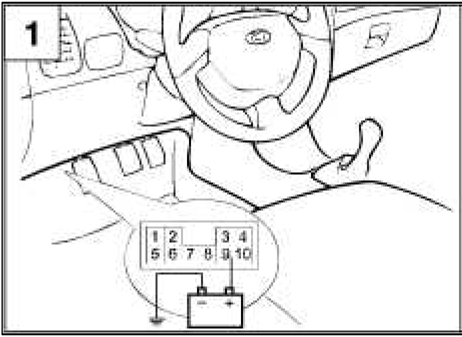

Fuel filter
Fuel pump

CIRCUIT DIAGRAM

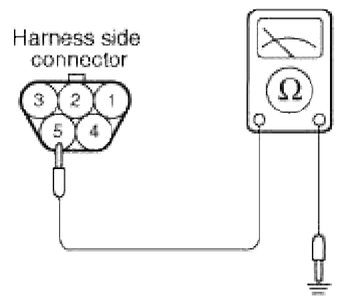
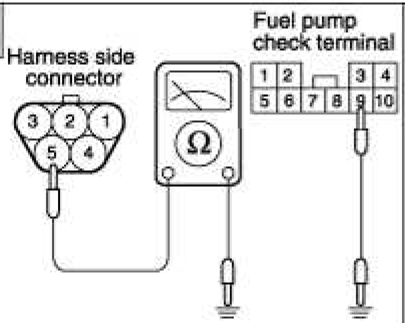
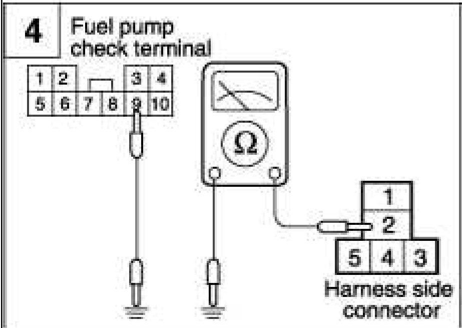
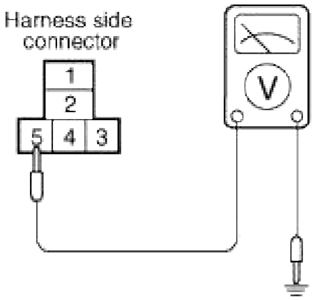
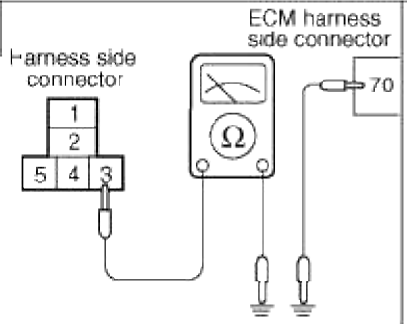

Engine compartment relay & fuse box
5
7
JOINT CONNECTOR
8
5
MFI (ENGINE) CONTROL RELAY
1
1
5
FUEL PUMP RELAY
2
3
4
9
M
5
FUEL PUMP CHECK CONNECTOR
70
Fuel pump relay control
ECM

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

HARNESS INSPECTION PROCEDURES

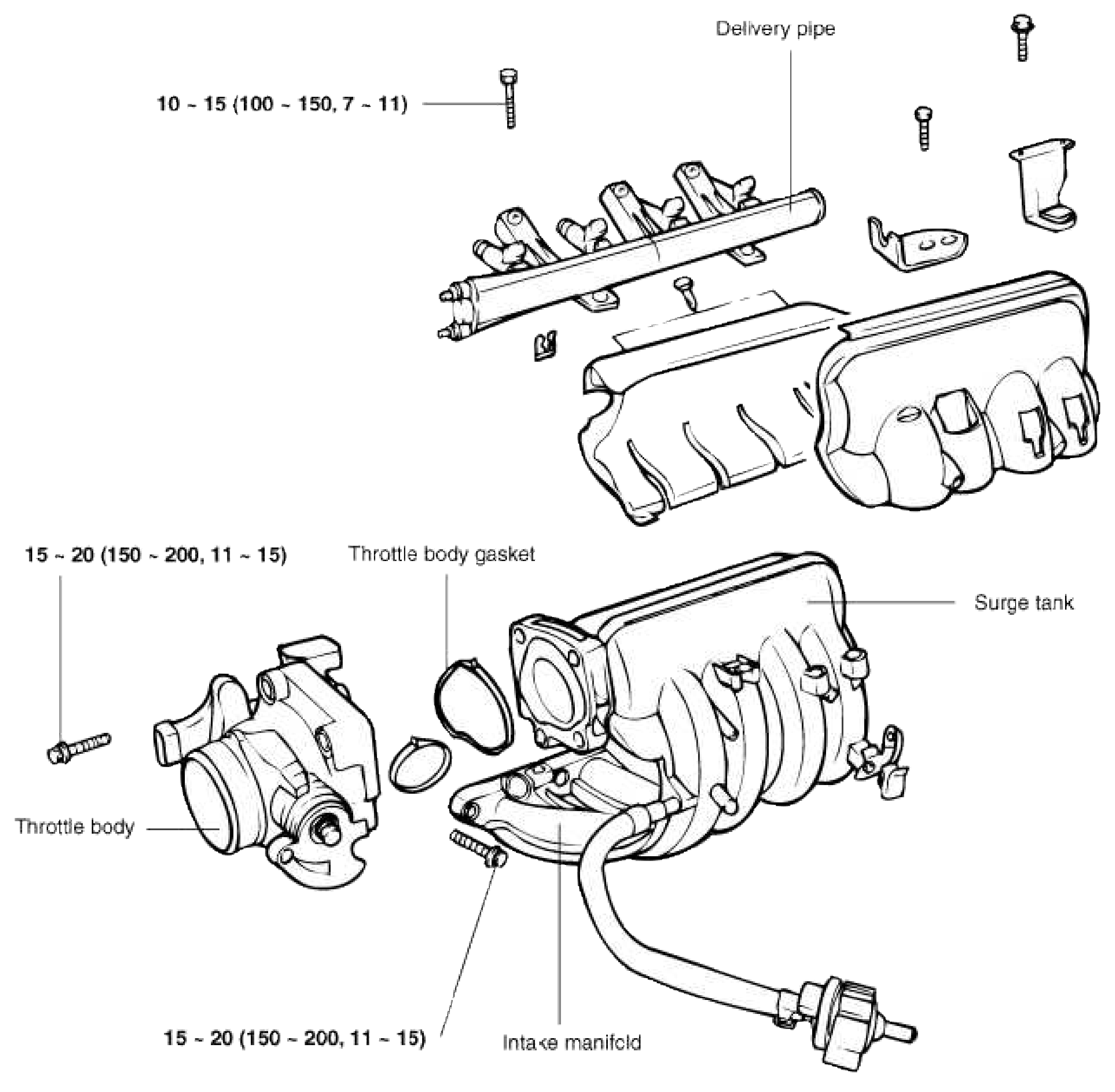
1 	Check the fuel pump. • Apply battery voltage to the checking terminal and operate the pump.	**OK** ⇨ **NG** ⇨	4 2

1 2 3 4
5 6 7 8 9 10

2	 Harness side connector 3 2 1 5 4 Ω	Check the ground circuit of the fuel pump. • Connector : Disconnected	**OK** ⇨ **NG** ⇨	3 Repair the harness.
3	 Fuel pump check terminal Harness side connector 1 2 3 4 5 6 7 8 9 10 3 2 1 5 4 Ω	Check for continuity between the fuel pump and the check terminal. • Connector : Disconnected	**OK** ⇨ **NG** ⇨	4 Repair the harness.
4	 Fuel pump check terminal 1 2 3 4 5 6 7 8 9 10 Ω 1 2 5 4 3 Harness side connector	Check for continuity between the check terminal and the fuel pump control relay terminal. • Control relay connector : Disconnected	**OK** ⇨ **NG** ⇨	5 Repair the harness.
5	 Harness side connector 1 2 5 4 3 V	Measure the power supply voltage of the control relay. • Control relay connector : Disconnected • Ignition switch : START • Voltage (V) : System voltage	**OK** ⇨ **NG** ⇨	6 Repair the harness.
6	 ECM harness side connector Harness side connector 70 1 2 5 4 3 Ω	Check for an open-circuit or a short-circuit to ground between the control relay and the ECM. • Control relay connector : Disconnected • ECM connector : Disconnected	**OK** ⇨ **NG** ⇨	**END!** Repair the harness.

Fuel System > Fuel Delivery System > Injector > Components and Components Location

COMPONENTS

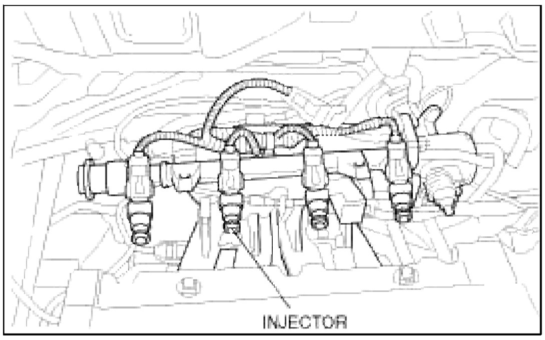

Delivery pipe
10 ~ 15 (100 ~ 150, 7 ~ 11)
15 ~ 20 (150 ~ 200, 11 ~ 15)
Throttle body gasket
Surge tank
Throttle body
15 ~ 20 (150 ~ 200, 11 ~ 15)
Intake manifold

TORQUE : Nm (kg.cm, lb.ft)

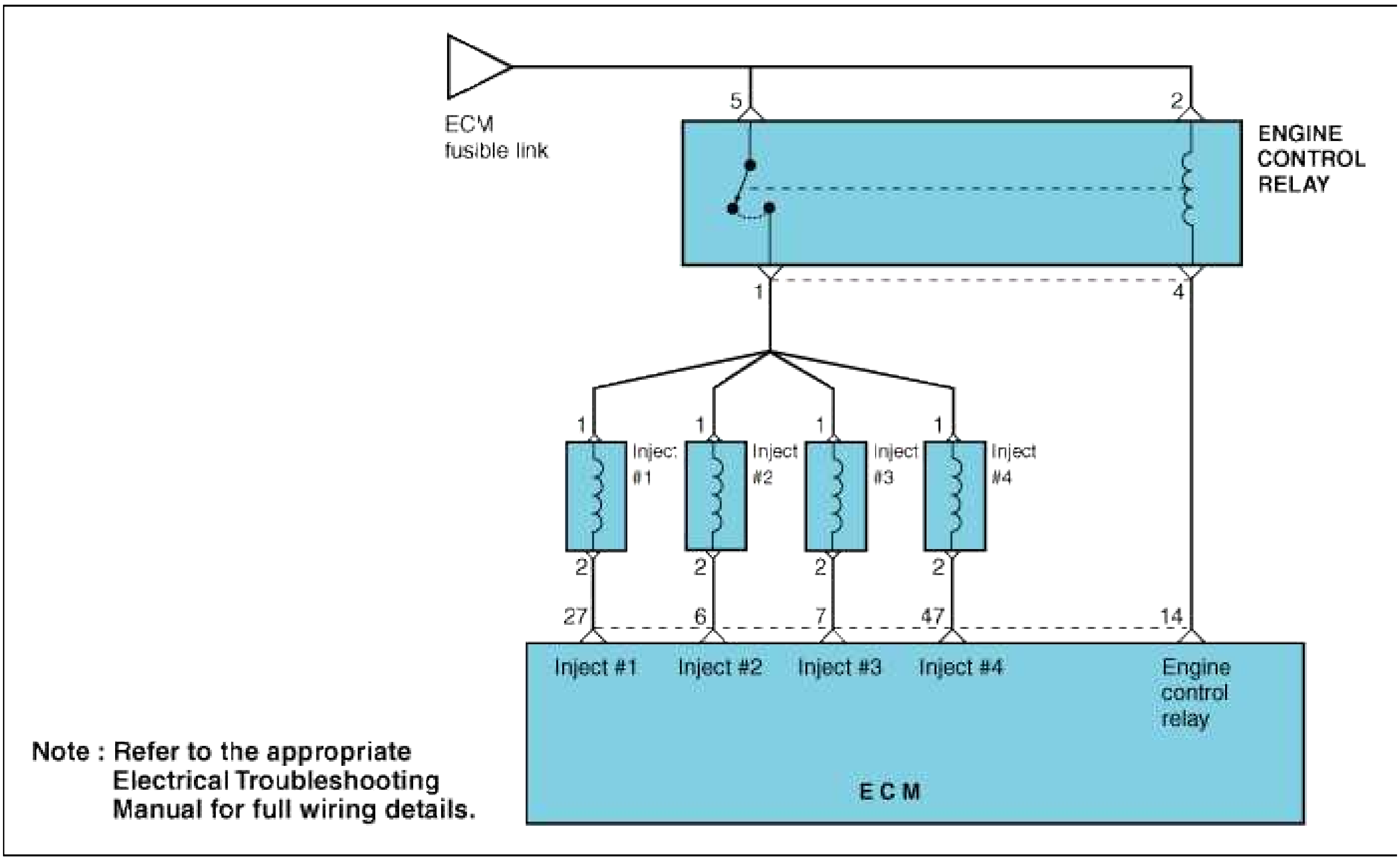
Fuel System > Fuel Delivery System > Injector > Troubleshooting

INJECTORS

The injectors inject fuel according to a signals from the ECM. The volumeof fuel injected by the injector is determined by the time during which thesolenoid valve is energized.



CIRCUIT DIAGRAM


ECM
fusible link
5
2
ENGINE
CONTROL
RELAY
1
4
1
1
1
1
Injec:
#1
Inject
#2
Inject
#3
Inject
#4
2
2
2
2
27
6
7
47
14
Inject #1
Inject #2
Inject #3
Inject #4
Engine
control
relay
E C M

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TROUBLESHOOTING HINTS

1. If the engine is difficult to start when it is hot, check low for fuel pressure and injector leaks.
2. If the injector does not operate when the engine is cranked, then check the following :
   - Faulty power supply circuit to the ECM or faulty ground circuit.
   - Faulty MFI control relay.
   - Faulty crankshaft position sensor or camshaft position sensor.
3. If engine idle remains unchanged when fuel injection to the cylinders is cut one after another, check for the following items about such cylinder :
   - Injector and harness.
   - Spark plug and high tension cable.
   - Compression pressure.
4. If the injection system is OK but the injector drive time is out of specification, check for the following items :
   - Poor combustion in the cylinder (faulty spark plug, ignition coil, compression pressure, etc.)
5. The MIL is on or the DTC is displayed on the HI-SCAN under the following condition.
   - When the injector itself is faulty.

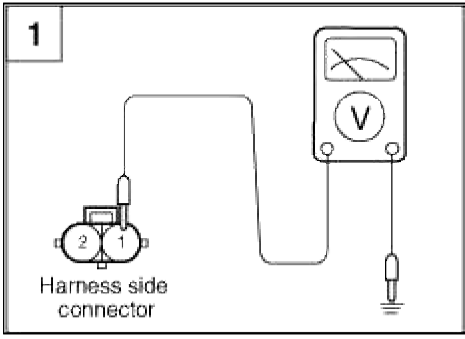
USING HI-SCAN

Check item	Data display	Check conditions	Engine state	Test specification
Injectors	Injector duration	• Engine coolant temperature : 80 to 95°C (176 to 205°F) • Lamps, electric cooling fan, accessory units : ALL OFF • Transaxle : Neutral (P range for vehicle with A/T) • Steering wheel : Neutral	Idle rpm	1.5 ~ 4.5 ms
			2000 rpm	
			3000 rpm	
			Racing	Increasing

Check item	Check condition	HI-SCAN display	Type
Injector • Actuator test	Start the engine	01. No.1 Injector	Activate
		02. No.2 Injector	Activate
		03. No.3 Injector	Activate
		04. No.4 Injector	Activate

HARNESS INSPECTION PROCEDURES

1



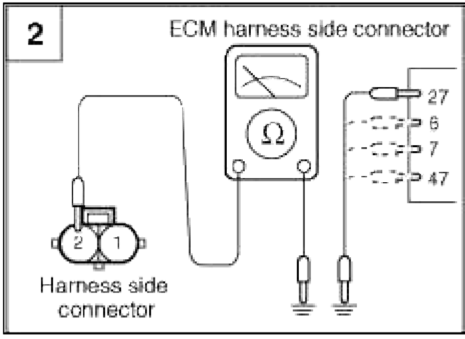
Measure the power supply voltage of the injector.

- Connector : Disconnected
- Ignition switch : ON
- Voltage (V) : Battery voltage

OK ⇨ **2**

NG ⇨ Repair the harness.

2



Check for an open-circuit, or a short-circuit to ground between the engine control module and the injector.

- ECM connector : Disconnected
- Injector connector : Disconnected

OK ⇨ **END!**

NG ⇨ Repair the harness.

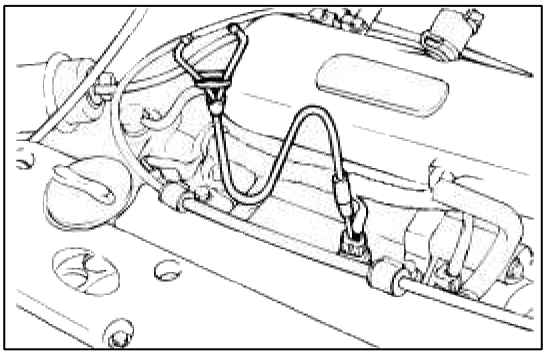
INJECTOR INSPECTION

OPERATION CHECK

Using a HI-SCAN :

- Activate the fuel injectors in sequence.

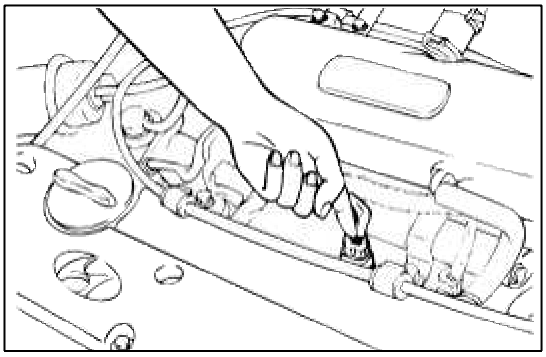
- Check the operating time of the injectors.



1. Using a stethoscope, check the injectors for a clicking sound at idle. Check that the sound is produced at shorter intervals as the engine speed increases.

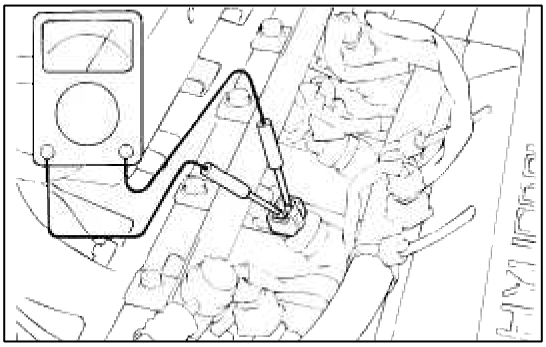
> NOTE
>
> Ensure that the sound from an adjacent injector is not being transmitted along the delivery pipe to an inoperative injector.

2. If a stethoscope is not available, check the injector operation with your finger.
   If no vibrations are felt, check the wiring connector, injector, or injection signal from ECM.



RESISTANCE MEASUREMENT BETWEEN TERMINALS

1. Disconnect the connector of the injector and measure the resistance betweenthe two terminals.



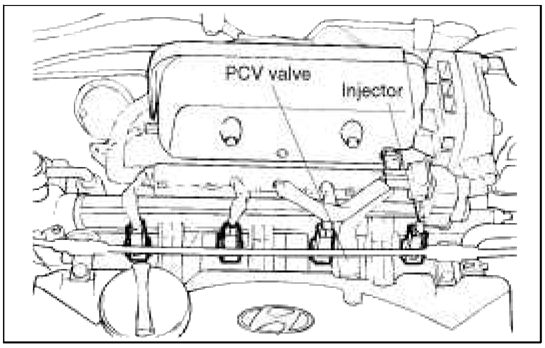
15.9 ± 0.35Ω [at 20°C (68°F)]

---

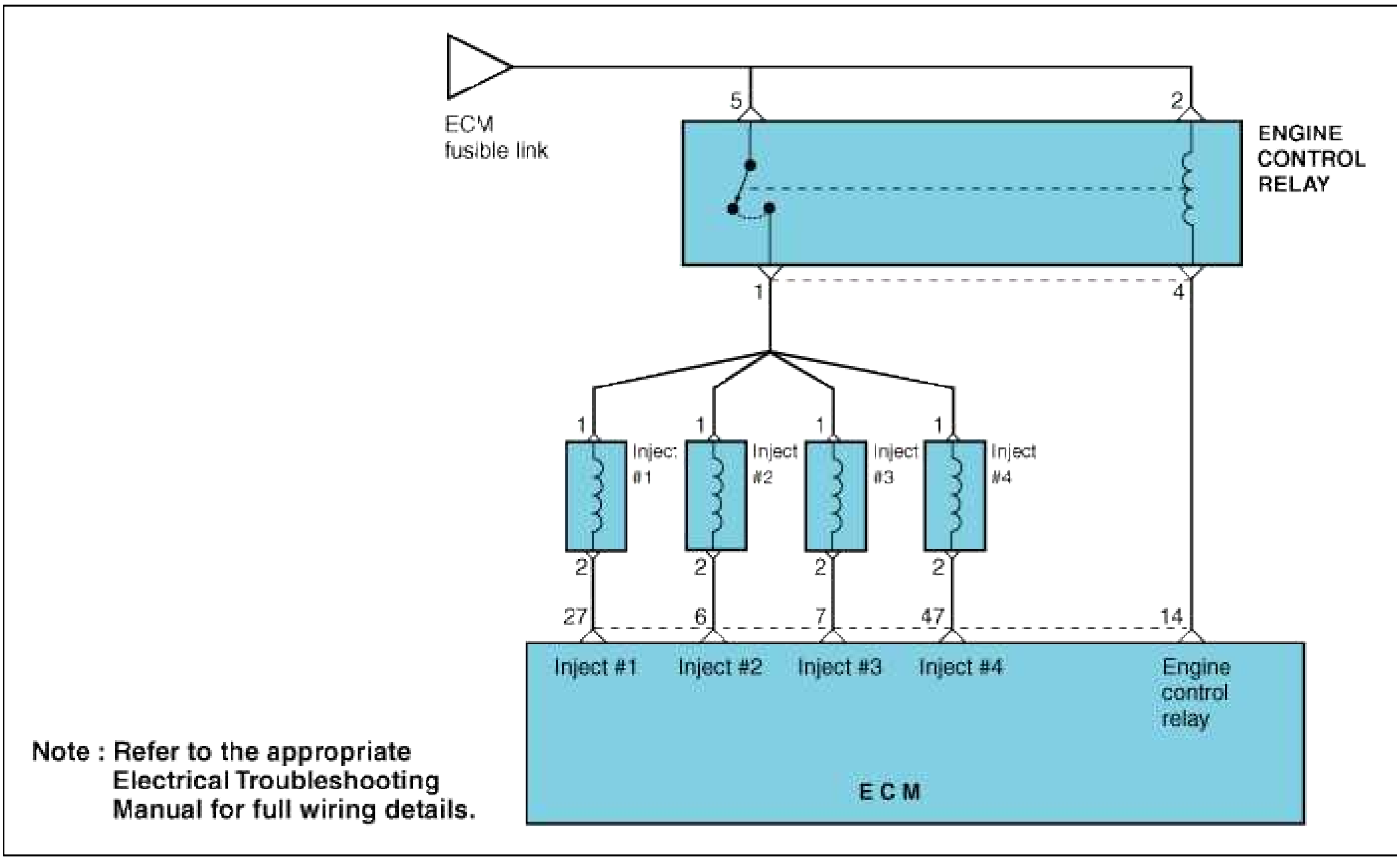
2. Re-connect the connector to the injector.

INJECTORS

The injectors inject fuel according to a signals from the ECM. The volume of fuel injected by the injector is determined by the time during which the solenoid valve is energized.


PCV valve
Injector

CIRCUIT DIAGRAM


ECM
fusible link
5
2
ENGINE
CONTROL
RELAY
1
4
1
1
1
1
Injec
#1
Inject
#2
Inject
#3
Inject
#4
2
2
2
2
27
6
7
47
14
Inject #1
Inject #2
Inject #3
Inject #4
Engine
control
relay
ECM

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TROUBLESHOOTING HINTS

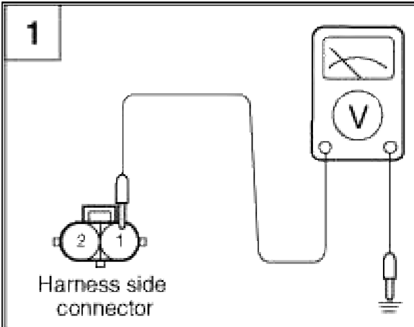
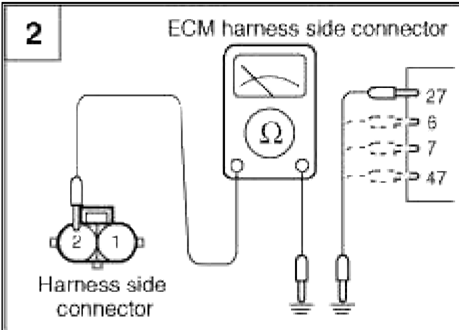
1. If the engine is difficult to start when it is hot, check low for fuel pressure and injector leaks.
2. If the injector does not operate when the engine is cranked, then check the following :
   - Faulty power supply circuit to the ECM or faulty ground circuit.
   - Faulty MFI control relay.
   - Faulty crankshaft position sensor or camshaft position sensor.
3. If engine idle remains unchanged when fuel injection to the cylinders is cut one after another, check for the following items about such cylinder :
   - Injector and harness.
   - Spark plug and high tension cable.
   - Compression pressure.
4. If the injection system is OK but the injector drive time is out of specification, check for the following items :
   - Poor combustion in the cylinder (faulty spark plug, ignition coil, compression pressure, etc.)
5. The MIL is on or the DTC is displayed on the HI-SCAN under the following condition.
   - When the injector itself is faulty.

USING HI-SCAN

Check item	Data display	Check conditions	Engine state	Test specification
Injectors	Injector duration	• Engine coolant temperature : 80 to 95°C (176 to 205°F) • Lamps, electric cooling fan, accessory units : ALL OFF • Transaxle : Neutral (P range for vehicle with A/T) • Steering wheel : Neutral	Idle rpm	1.5 ~ 4.5 ms
			2000 rpm	
			3000 rpm	
			Racing	Increasing

Check item	Check condition	HI-SCAN display	Type
Injector • Actuator test	Start the engine	01. No.1 Injector	Activate
		02. No.2 Injector	Activate
		03. No.3 Injector	Activate
		04. No.4 Injector	Activate

HARNESS INSPECTION PROCEDURES

1		Measure the power supply voltage of the injector. • Connector : Disconnected • Ignition switch : ON • Voltage (V) : Battery voltage	OK ⇨ NG ⇨	2 Repair the harness.
2	 ECM harness side connector Ω 27 6 7 47 2 1 Harness side connector	Check for an open-circuit, or a short-circuit to ground between the engine control module and the injector. • ECM connector : Disconnected • Injector connector : Disconnected	OK ⇨ NG ⇨	END! Repair the harness.

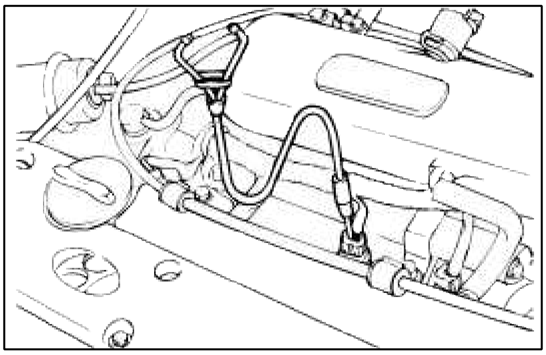
INJECTOR INSPECTION

OPERATION CHECK

Using a HI-SCAN :

- Activate the fuel injectors in sequence.

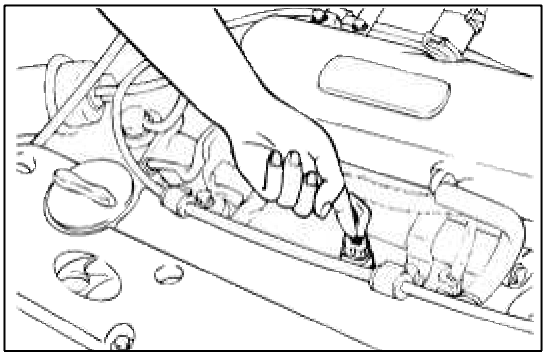
- Check the operating time of the injectors.



1. Using a stethoscope, check the injectors for a clicking sound at idle. Check that the sound is produced at shorter intervals as the engine speed increases.

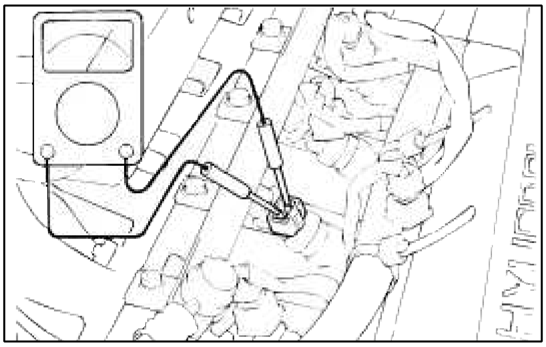
> **NOTE**
>
> Ensure that the sound from an adjacent injector is not being transmitted along the delivery pipe to an inoperative injector.

2. If a stethoscope is not available, check the injector operation with your finger.
   If no vibrations are felt, check the wiring connector, injector, or injection signal from ECM.



RESISTANCE MEASUREMENT BETWEEN TERMINALS

1. Disconnect the connector of the injector and measure the resistance betweenthe two terminals.



15.9 ± 0.35Ω [at 20°C (68°F)]

---

2. Re-connect the connector to the injector.

Fuel System > Fuel Delivery System > Injector > Repair procedures

REMOVAL

1. Release residual pressure from the fuel line to prevent fuel from spilling.

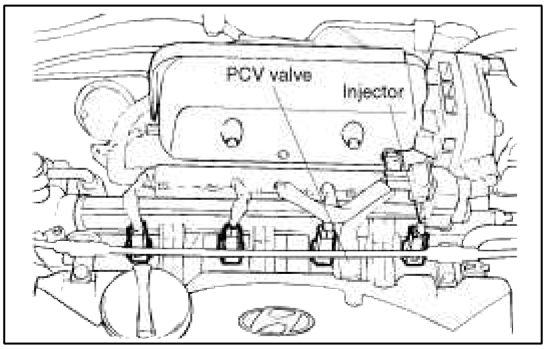
CAUTION

Cover the hose connection with rags to prevent splashing of fuel that could be caused by residual pressure in the fuel line.

2. Remove the delivery pipe with the fuel injectors.

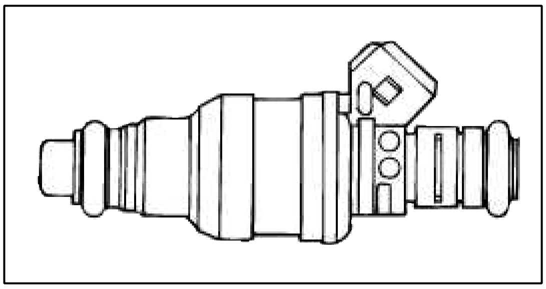
CAUTION

- Be careful not to drop any injectors when removing the delivery pipe.
- Be aware that fuel may flow out when removing the injector.



INSTALLATION

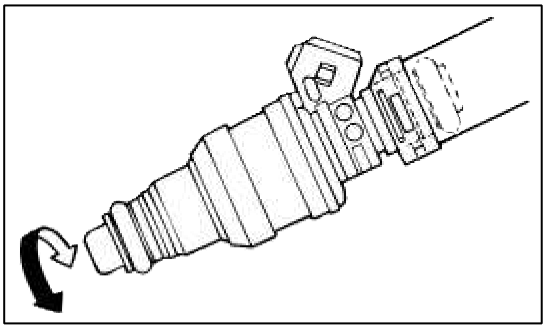
1. Install a new grommet and O-ring to the injector.
2. Apply a coating of solvent, spindle oil or gasoline to the O-ring of the injector.



3. While turning the injector to the left and right, fit it on to the delivery pipe.
4. Be sure the injector turns smoothly.

NOTE

If it does turn smoothly, the O-ring may be jammed: Remove the injector and re-insert it into the delivery pipe and recheck.

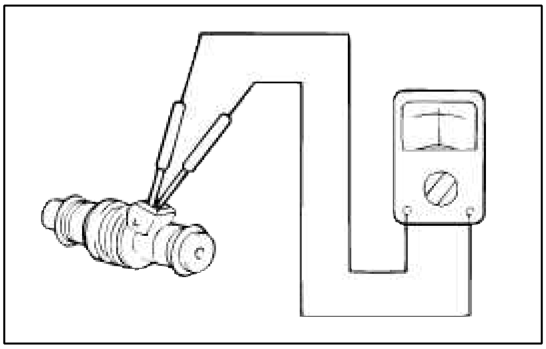


INSPECTION

1. Measure the resistance of the injectors between the terminals using an ohmmeter.

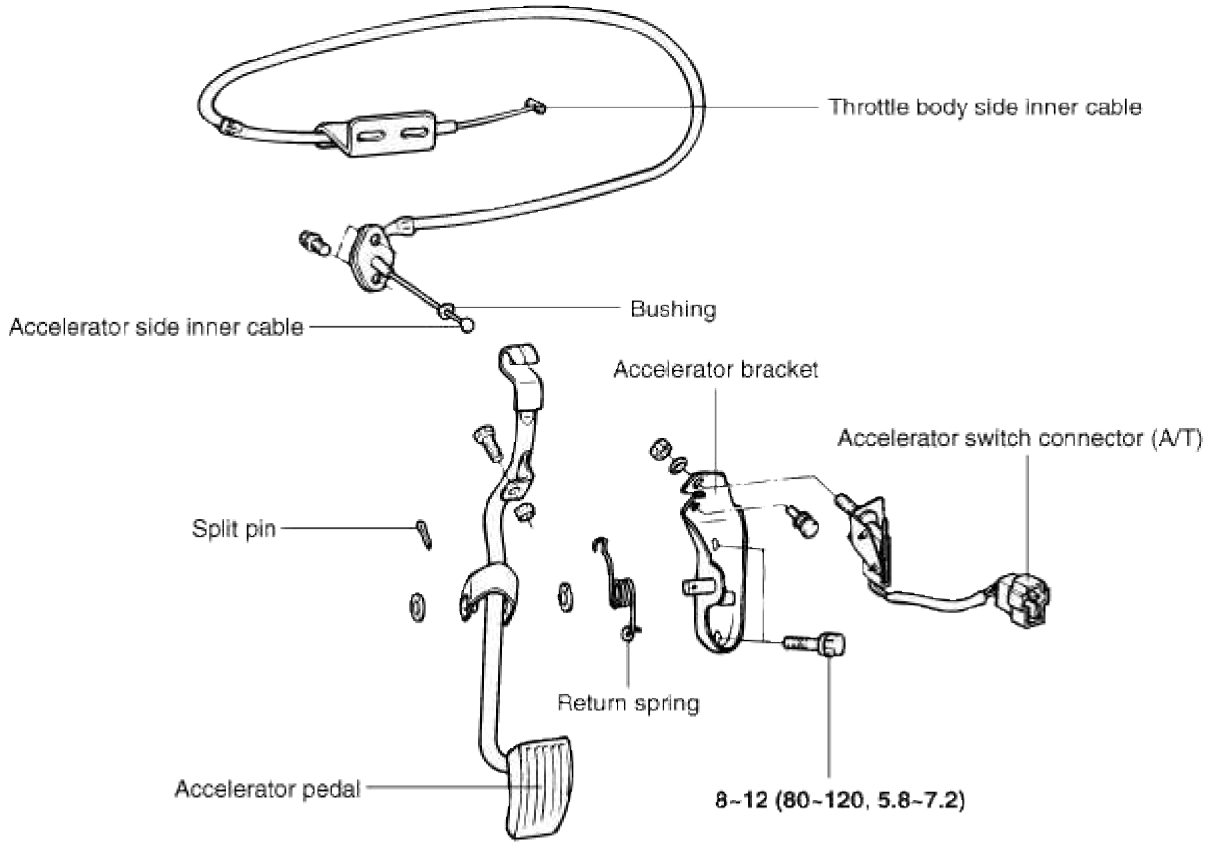
Resistance : 15.9 ± 0.35Ω [at 20°C (68°F)]

2. If the resistance is not within specifications, replace the injector.



Fuel System > Fuel Delivery System > Accelerator Pedal and Cable > Components and Components Location

COMPONENTS

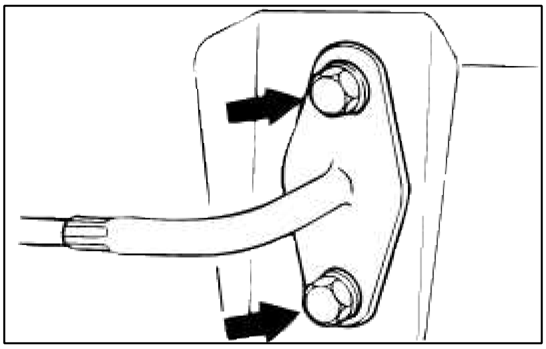

Throttle body side inner cable
Bushing
Accelerator side inner cable
Accelerator bracket
Accelerator switch connector (A/T)
Split pin
Return spring
Accelerator pedal
8~12 (80~120, 5.8~7.2)

TORQUE : Nm (kg·cm, lb·ft)

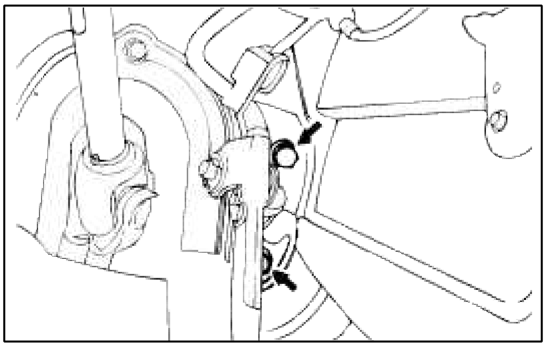
Fuel System > Fuel Delivery System > Accelerator Pedal and Cable > Repair procedures

REMOVAL

1. Remove the bushing and inner cable of the accelerator arm side.

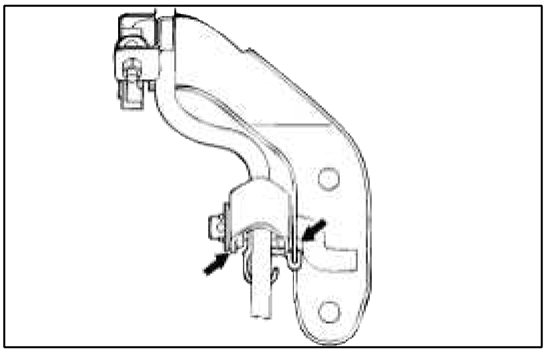


2. After disconnecting the accelerator switch connector, loosen the bolts of the accelerator arm bracket and remove.



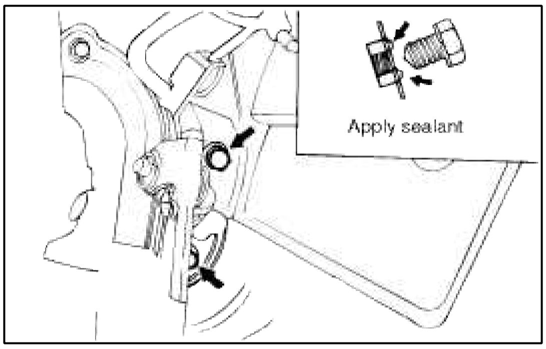
INSTALLATION

1. When installing the return spring and accelerator arm, apply multi-purpose grease around each moving point of the accelerator arm.



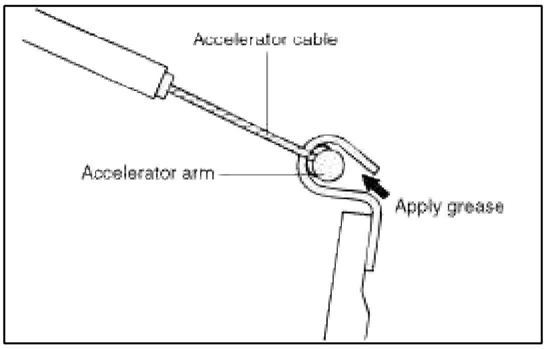
2. Apply sealant to the bolt mounting hole, and tighten the accelerator arm bracket.

Tightening torque
Accelerator arm bracket bolts :
8 ~ 12 Nm (80 ~ 120 kg·cm, 5.8 ~ 7.2 lb·ft)



3. Securely install the resin bushing of the accelerator cable on the end of the accelerator arm.

4. Apply multipurpose grease around the cable end.



INSPECTION

1. Check the inner and outer cable for damage.
2. Check the cable for smooth movement.
3. Check the accelerator arm for deformation.
4. Check the return spring for deterioration.
5. Check the connection of the bushing to end metal fitting.
6. Check that the accelerator switch operates properly.

Fuel System > Troubleshooting > P0106

[P0106/P0107/P0108]

DTC	Diagnostic item
P0106	MAP Sensor Rationality
P0107	MAP Sensor Range Check Low
P0108	MAP Sensor Range Check High

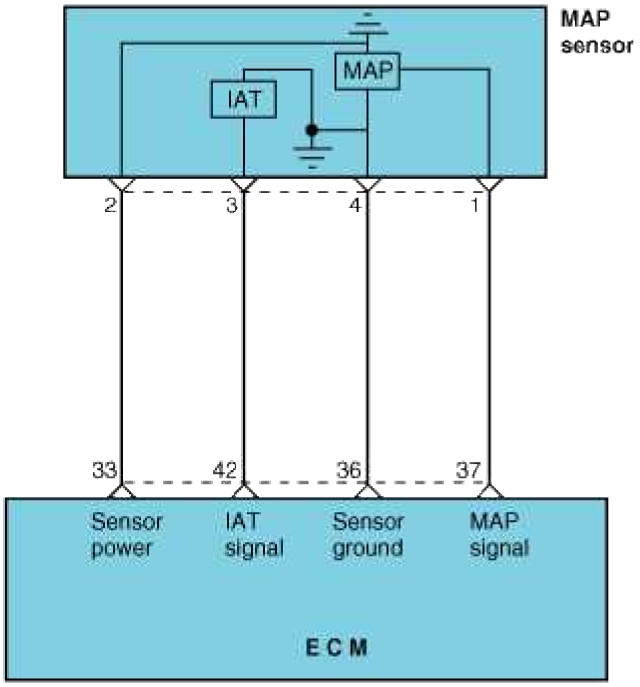
DESCRIPTION

The MAP sensor is essentially a strain gauge used to measure the pressure in the surge tank. Inside the sensor is a metal diaphragm with a small wire attached. The diaphragm flexes according to changes in pressure. When the diaphragm flexes, the wire attached to it stretches, changing the resistance of the wire. The Engine control Module (ECM) applies five volts to the MAP sensor and measures the voltage drop across the sensor. Sensor output is in volts and as pressure decreases, the voltage drop across the sensor increases. Since the MAP sensor is used as an air flow sensor, the sensor signal is an important input. The ECM uses the information to determine fuel amount and ignition timing.

FAILURE CONDITIONS

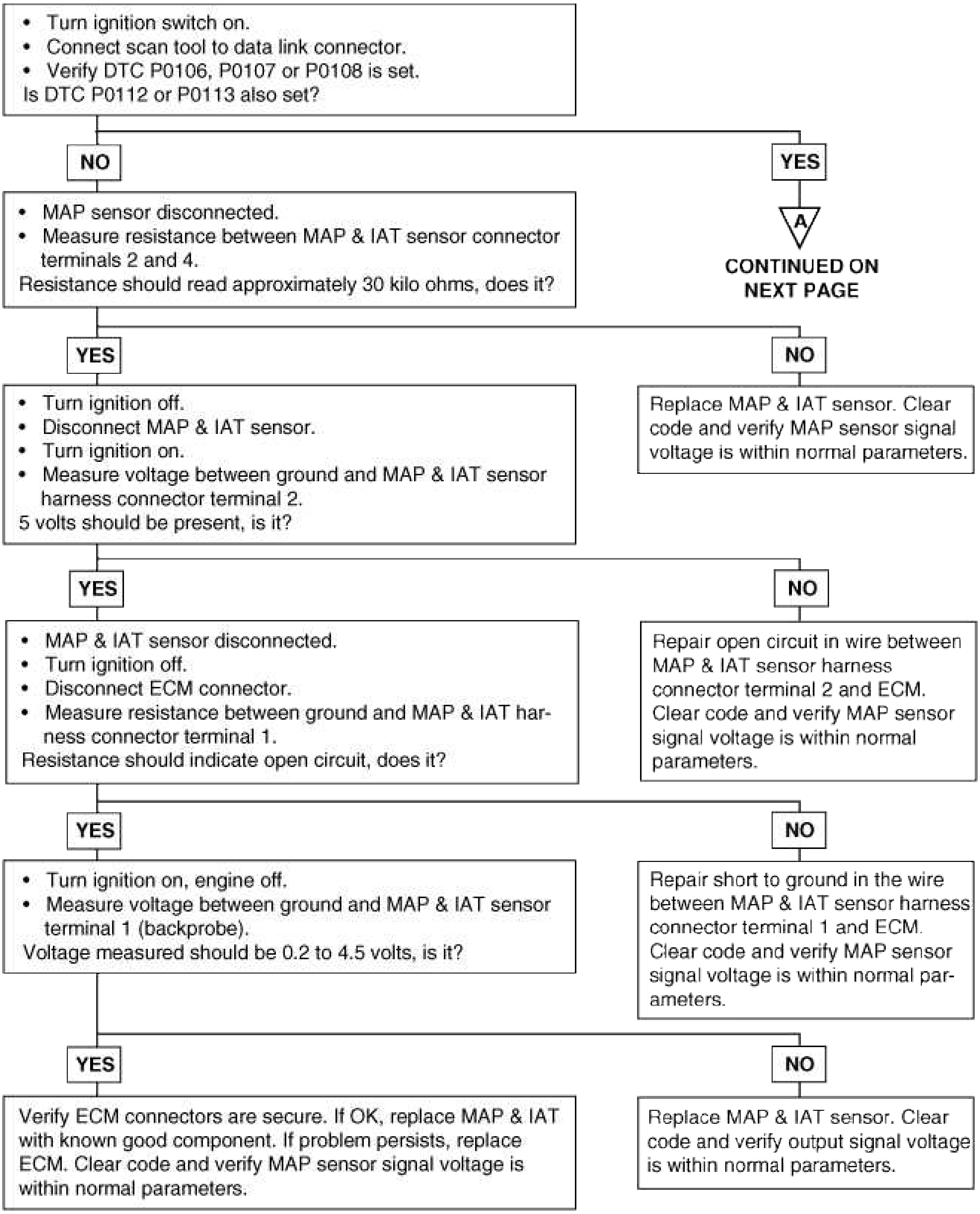
The MAP sensor outputs a voltage which corresponds to the pressure in the surge tank. The ECM checks whether this voltage is within a specified range. The ECM will set P0106 and the Malfunction Indicator Lamp (MIL) will turn on if the MAP sensor output voltage has continued to be 4.5V or higher - corresponding to a surge tank pressure of 114kPa (17psi) or higher - for 4 sec. or to be 1.95V or lower - corresponding to a surge tank pressure of 50kPa (7.4psi) or lower - for 4 sec.

CIRCUIT DIAGRAM


MAP
sensor
MAP
IAT
2
3
4
1
33
42
36
37
Sensor
power
IAT
signal
Sensor
ground
MAP
signal
E C M

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn ignition switch on.
- Connect scan tool to data link connector.
- Verify DTC P0106, P0107 or P0108 is set.

Is DTC P0112 or P0113 also set?

- MAP sensor disconnected.
- Measure resistance between MAP & IAT sensor connector terminals 2 and 4.

Resistance should read approximately 30 kilo ohms, does it?

CONTINUED ON NEXT PAGE

- Turn ignition off.
- Disconnect MAP & IAT sensor.
- Turn ignition on.
- Measure voltage between ground and MAP & IAT sensor harness connector terminal 2.

5 volts should be present, is it?

Replace MAP & IAT sensor. Clear code and verify MAP sensor signal voltage is within normal parameters.

- MAP & IAT sensor disconnected.
- Turn ignition off.
- Disconnect ECM connector.
- Measure resistance between ground and MAP & IAT harness connector terminal 1.

Resistance should indicate open circuit, does it?

Repair open circuit in wire between MAP & IAT sensor harness connector terminal 2 and ECM. Clear code and verify MAP sensor signal voltage is within normal parameters.

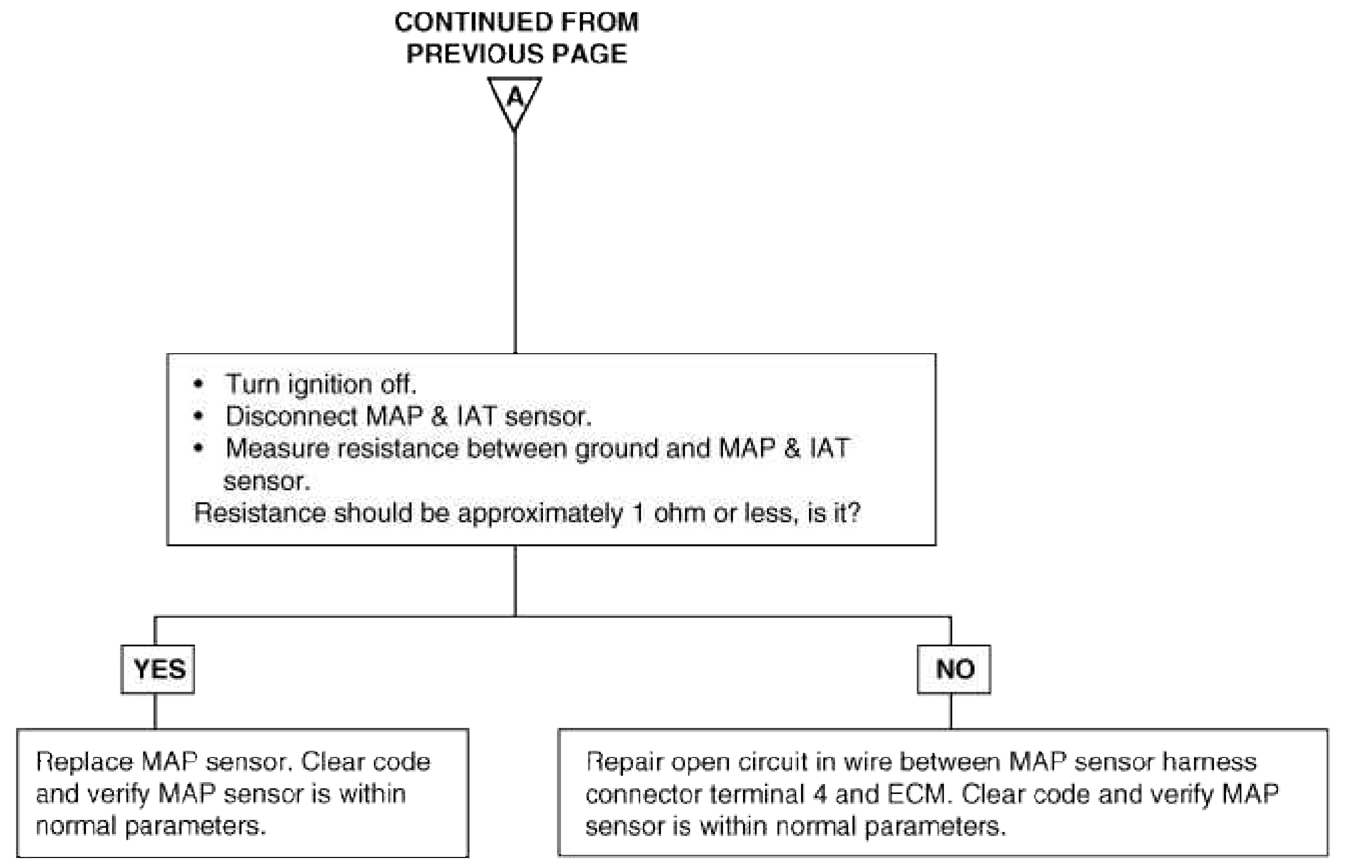
- Turn ignition on, engine off.
- Measure voltage between ground and MAP & IAT sensor terminal 1 (backprobe).

Voltage measured should be 0.2 to 4.5 volts, is it?

Repair short to ground in the wire between MAP & IAT sensor harness connector terminal 1 and ECM. Clear code and verify MAP sensor signal voltage is within normal parameters.

Verify ECM connectors are secure. If OK, replace MAP & IAT with known good component. If problem persists, replace ECM. Clear code and verify MAP sensor signal voltage is within normal parameters.

Replace MAP & IAT sensor. Clear code and verify output signal voltage is within normal parameters.



- Turn ignition off.
- Disconnect MAP & IAT sensor.
- Measure resistance between ground and MAP & IAT sensor.

Resistance should be approximately 1 ohm or less, is it?

YES: Replace MAP sensor. Clear code and verify MAP sensor is within normal parameters.

NO: Repair open circuit in wire between MAP sensor harness connector terminal 4 and ECM. Clear code and verify MAP sensor is within normal parameters.

Fuel System > Troubleshooting > P0107

[P0106/P0107/P0108]

DTC	Diagnostic item
P0106	MAP Sensor Rationality
P0107	MAP Sensor Range Check Low
P0108	MAP Sensor Range Check High

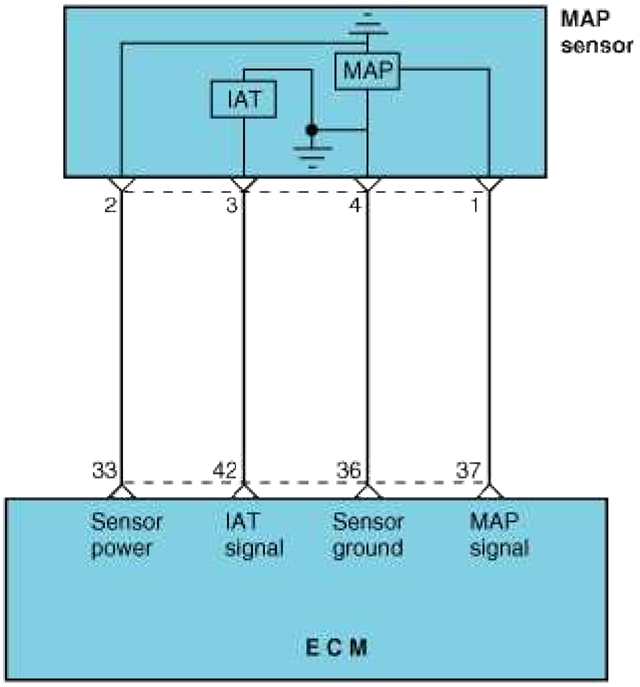
DESCRIPTION

The MAP sensor is essentially a strain gauge used to measure the pressure in the surge tank. Inside the sensor is a metal diaphragm with a small wire attached. The diaphragm flexes according to changes in pressure. When the diaphragm flexes, the wire attached to it stretches, changing the resistance of the wire. The Engine control Module (ECM) applies five volts to the MAP sensor and measures the voltage drop across the sensor. Sensor output is in volts and as pressure decreases, the voltage drop across the sensor increases. Since the MAP sensor is used as an air flow sensor, the sensor signal is an important input. The ECM uses the information to determine fuel amount and ignition timing.

FAILURE CONDITIONS

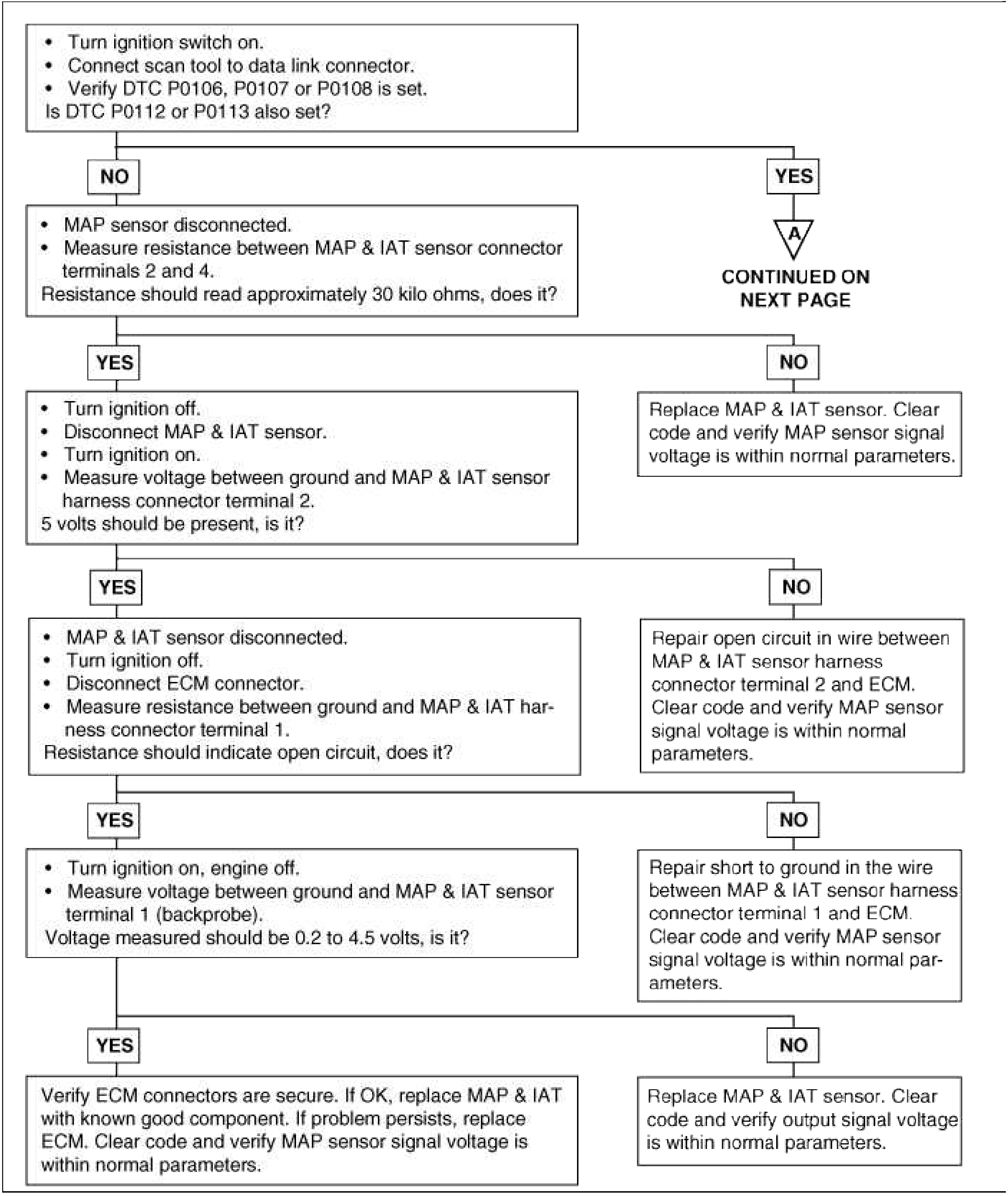
The MAP sensor outputs a voltage which corresponds to the pressure in the surge tank. The ECM checks whether this voltage is within a specified range. The ECM will set P0106 and the Malfunction Indicator Lamp (MIL) will turn on if the MAP sensor output voltage has continued to be 4.5V or higher - corresponding to a surge tank pressure of 114kPa (17psi) or higher - for 4 sec. or to be 1.95V or lower - corresponding to a surge tank pressure of 50kPa (7.4psi) or lower - for 4 sec.

CIRCUIT DIAGRAM


MAP
sensor
MAP
IAT
2
3
4
1
33
42
36
37
Sensor
power
IAT
signal
Sensor
ground
MAP
signal
E C M

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn ignition switch on.
- Connect scan tool to data link connector.
- Verify DTC P0106, P0107 or P0108 is set.

Is DTC P0112 or P0113 also set?

- MAP sensor disconnected.
- Measure resistance between MAP & IAT sensor connector terminals 2 and 4.

Resistance should read approximately 30 kilo ohms, does it?

A CONTINUED ON NEXT PAGE

- Turn ignition off.
- Disconnect MAP & IAT sensor.
- Turn ignition on.
- Measure voltage between ground and MAP & IAT sensor harness connector terminal 2.

5 volts should be present, is it?

Replace MAP & IAT sensor. Clear code and verify MAP sensor signal voltage is within normal parameters.

- MAP & IAT sensor disconnected.
- Turn ignition off.
- Disconnect ECM connector.
- Measure resistance between ground and MAP & IAT harness connector terminal 1.

Resistance should indicate open circuit, does it?

Repair open circuit in wire between MAP & IAT sensor harness connector terminal 2 and ECM. Clear code and verify MAP sensor signal voltage is within normal parameters.

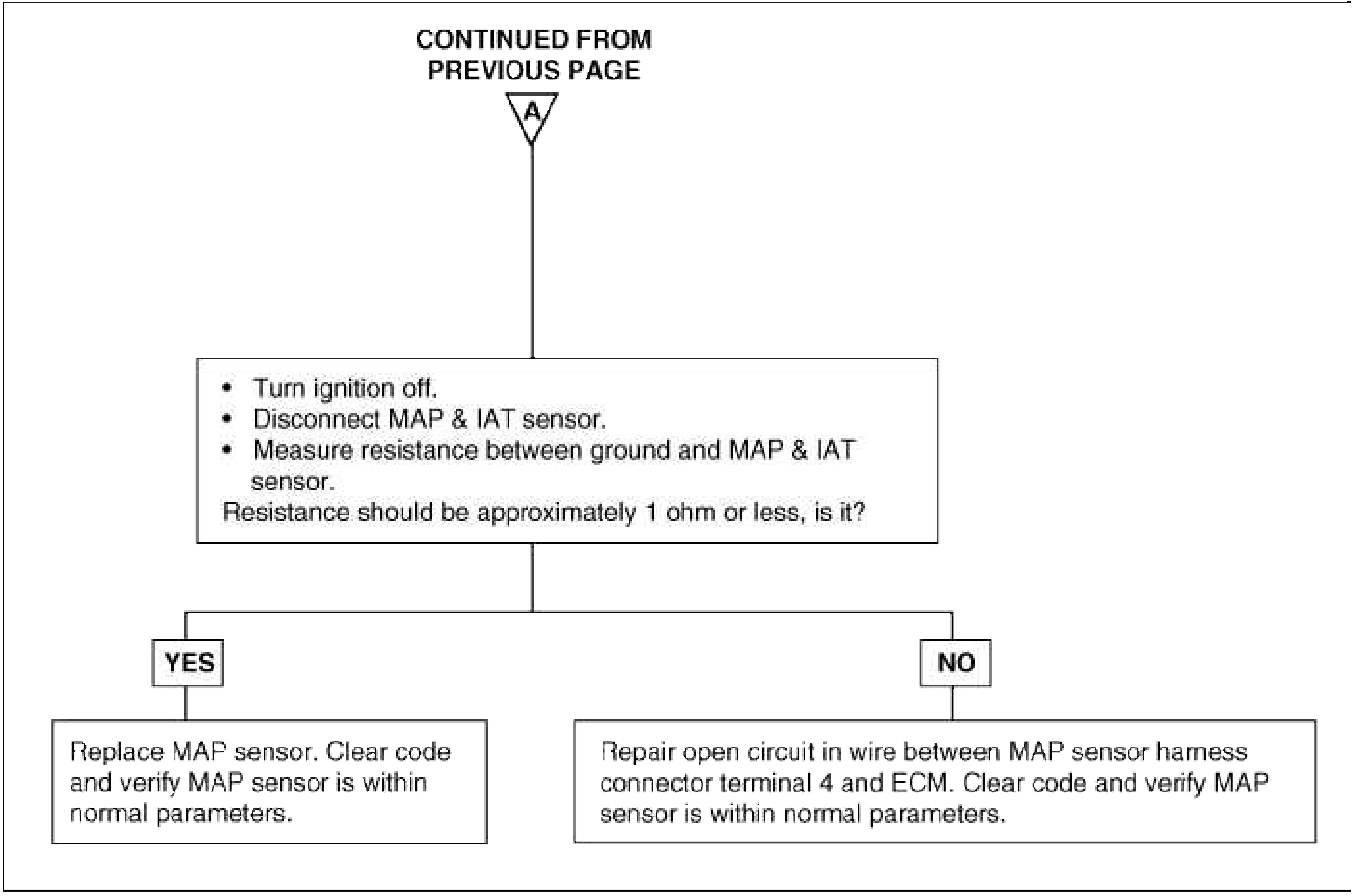
- Turn ignition on, engine off.
- Measure voltage between ground and MAP & IAT sensor terminal 1 (backprobe).

Voltage measured should be 0.2 to 4.5 volts, is it?

Repair short to ground in the wire between MAP & IAT sensor harness connector terminal 1 and ECM. Clear code and verify MAP sensor signal voltage is within normal parameters.

Verify ECM connectors are secure. If OK, replace MAP & IAT with known good component. If problem persists, replace ECM. Clear code and verify MAP sensor signal voltage is within normal parameters.

Replace MAP & IAT sensor. Clear code and verify output signal voltage is within normal parameters.


CONTINUED FROM PREVIOUS PAGE
A
• Turn ignition off.
• Disconnect MAP & IAT sensor.
• Measure resistance between ground and MAP & IAT sensor.
Resistance should be approximately 1 ohm or less, is it?
YES
NO
Replace MAP sensor. Clear code and verify MAP sensor is within normal parameters.
Repair open circuit in wire between MAP sensor harness connector terminal 4 and ECM. Clear code and verify MAP sensor is within normal parameters.

Fuel System > Troubleshooting > P0108

[P0106/P0107/P0108]

DTC	Diagnostic item
P0106 P0107 P0108	MAP Sensor Rationality MAP Sensor Range Check Low MAP Sensor Range Check High

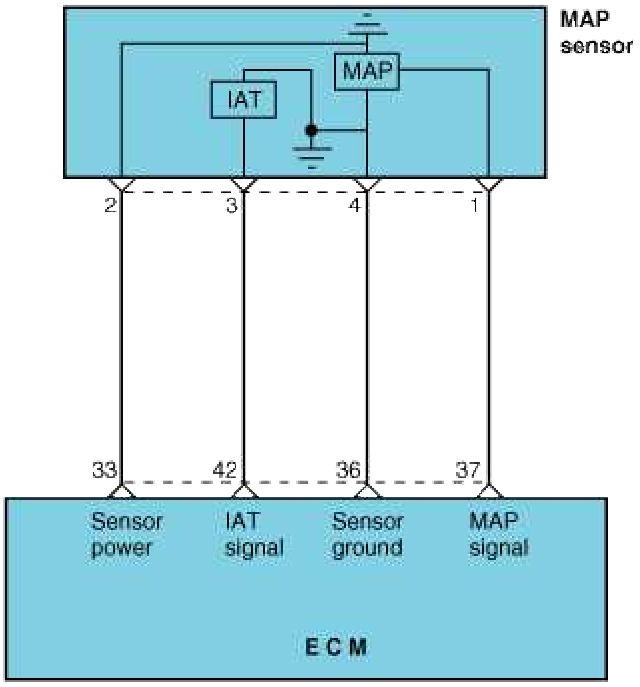
DESCRIPTION

The MAP sensor is essentially a strain gauge used to measure the pressure in the surge tank. Inside the sensor is a metal diaphragm with a small wire attached. The diaphragm flexes according to changes in pressure. When the diaphragm flexes, the wire attached to it stretches, changing the resistance of the wire. The Engine control Module (ECM) applies five volts to the MAP sensor and measures the voltage drop across the sensor. Sensor output is in volts and as pressure decreases, the voltage drop across the sensor increases. Since the MAP sensor is used as an air flow sensor, the sensor signal is an important input. The ECM uses the information to determine fuel amount and ignition timing.

FAILURE CONDITIONS

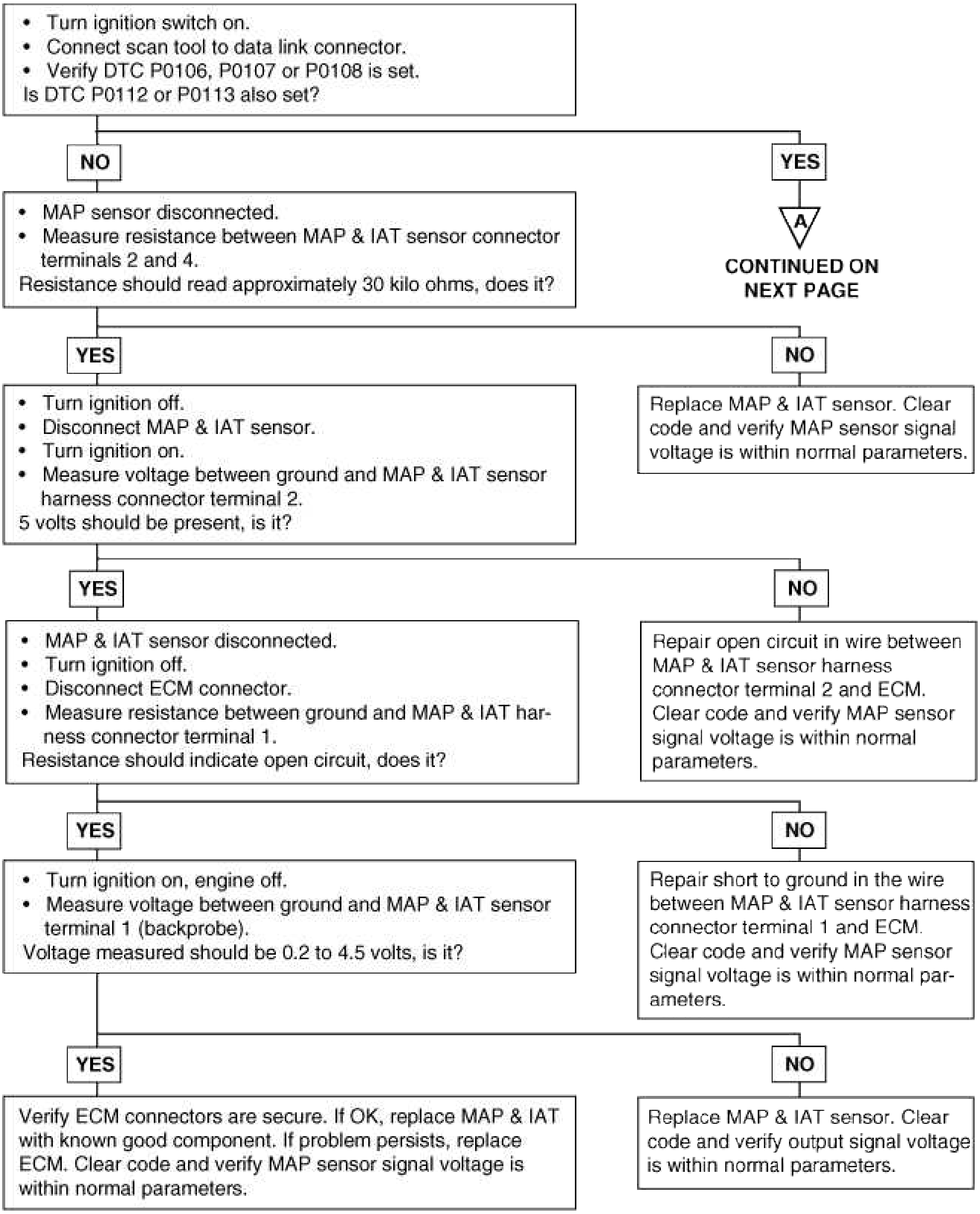
The MAP sensor outputs a voltage which corresponds to the pressure in the surge tank. The ECM checks whether this voltage is within a specified range. The ECM will set P0106 and the Malfunction Indicator Lamp (MIL) will turn on if the MAP sensor output voltage has continued to be 4.5V or higher - corresponding to a surge tank pressure of 114kPa (17psi) or higher - for 4 sec. or to be 1.95V or lower - corresponding to a surge tank pressure of 50kPa (7.4psi) or lower - for 4 sec.

CIRCUIT DIAGRAM


MAP
sensor
MAP
IAT
2
3
4
1
33
42
36
37
Sensor power
IAT signal
Sensor ground
MAP signal
E C M

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn ignition switch on.
- Connect scan tool to data link connector.
- Verify DTC P0106, P0107 or P0108 is set.

Is DTC P0112 or P0113 also set?

CONTINUED ON NEXT PAGE

- MAP sensor disconnected.
- Measure resistance between MAP & IAT sensor connector terminals 2 and 4.

Resistance should read approximately 30 kilo ohms, does it?

Replace MAP & IAT sensor. Clear code and verify MAP sensor signal voltage is within normal parameters.

- Turn ignition off.
- Disconnect MAP & IAT sensor.
- Turn ignition on.
- Measure voltage between ground and MAP & IAT sensor harness connector terminal 2.

5 volts should be present, is it?

Repair open circuit in wire between MAP & IAT sensor harness connector terminal 2 and ECM. Clear code and verify MAP sensor signal voltage is within normal parameters.

- MAP & IAT sensor disconnected.
- Turn ignition off.
- Disconnect ECM connector.
- Measure resistance between ground and MAP & IAT harness connector terminal 1.

Resistance should indicate open circuit, does it?

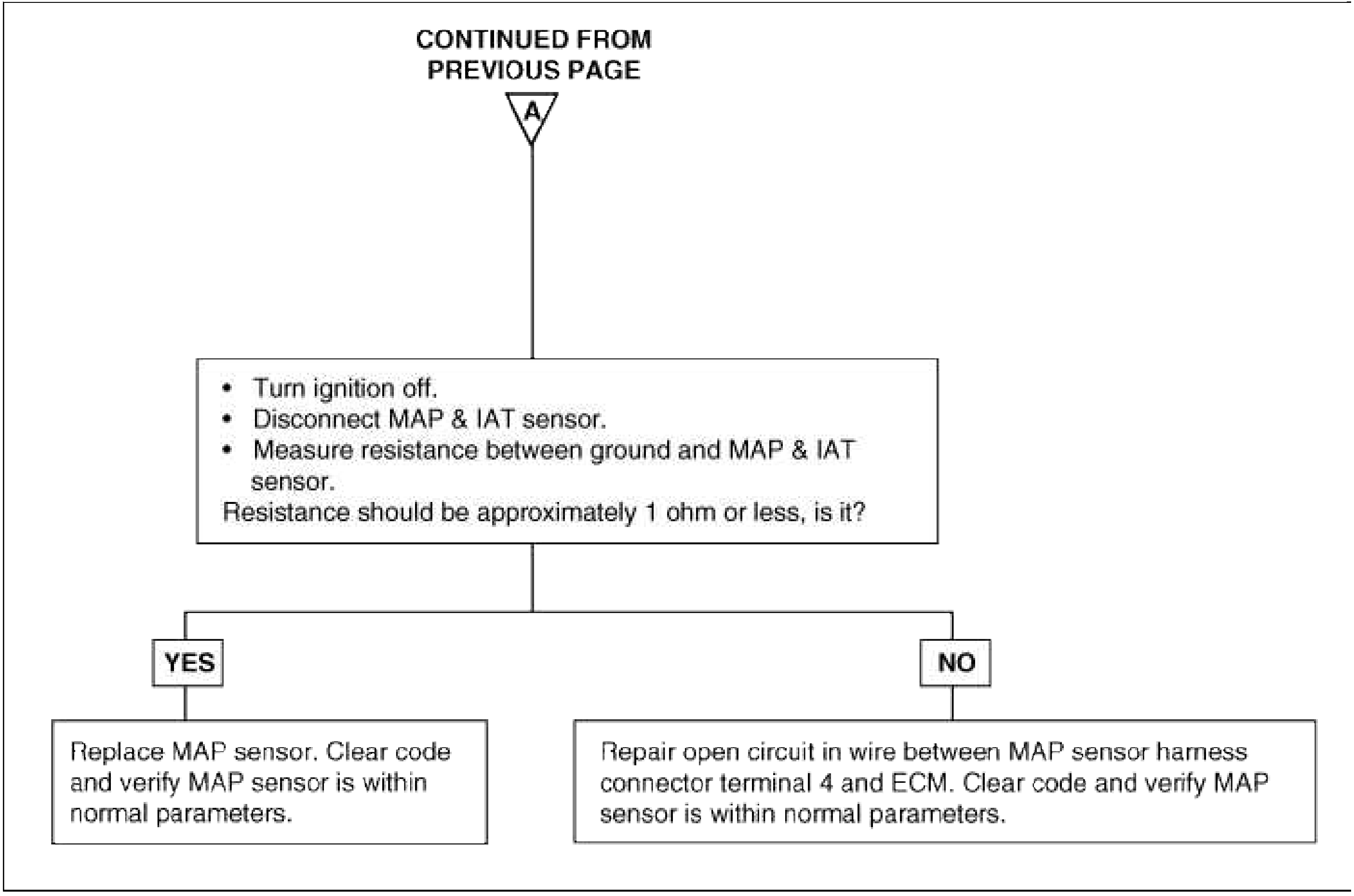
Repair short to ground in the wire between MAP & IAT sensor harness connector terminal 1 and ECM. Clear code and verify MAP sensor signal voltage is within normal parameters.

- Turn ignition on, engine off.
- Measure voltage between ground and MAP & IAT sensor terminal 1 (backprobe).

Voltage measured should be 0.2 to 4.5 volts, is it?

Verify ECM connectors are secure. If OK, replace MAP & IAT with known good component. If problem persists, replace ECM. Clear code and verify MAP sensor signal voltage is within normal parameters.

Replace MAP & IAT sensor. Clear code and verify output signal voltage is within normal parameters.



- Turn ignition off.
- Disconnect MAP & IAT sensor.
- Measure resistance between ground and MAP & IAT sensor.

Resistance should be approximately 1 ohm or less, is it?

Replace MAP sensor. Clear code and verify MAP sensor is within normal parameters.

Repair open circuit in wire between MAP sensor harness connector terminal 4 and ECM. Clear code and verify MAP sensor is within normal parameters.

Fuel System > Troubleshooting > P0111

[P0111/P0112/P0113]

DTC	Diagnostic item
P0111	Intake Air Temperature Circuit Range/Performance
P0112	Intake Air Temperature Low Input
P0113	Intake Air Temperature High Input

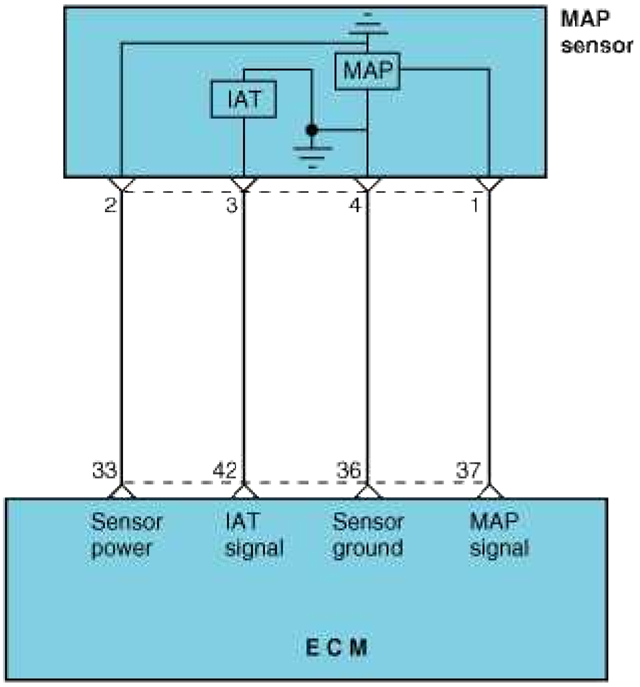
DESCRIPTION

The Intake air temperature (IAT) sensor is built-in to the MAP sensor. The IAT sensor is a variable resistor whose resistance changes as the temperature of the air flowing through the air intake changes. The Engine Control Module (ECM) uses the IAT sensor input to adjust fuel injector pulse width. When the temperature sensed is cold, the ECM enriches fuel mixture by increasing injector pulse width; as the air warms, the injector pulse width time is shortened.

FAILURE CONDITIONS

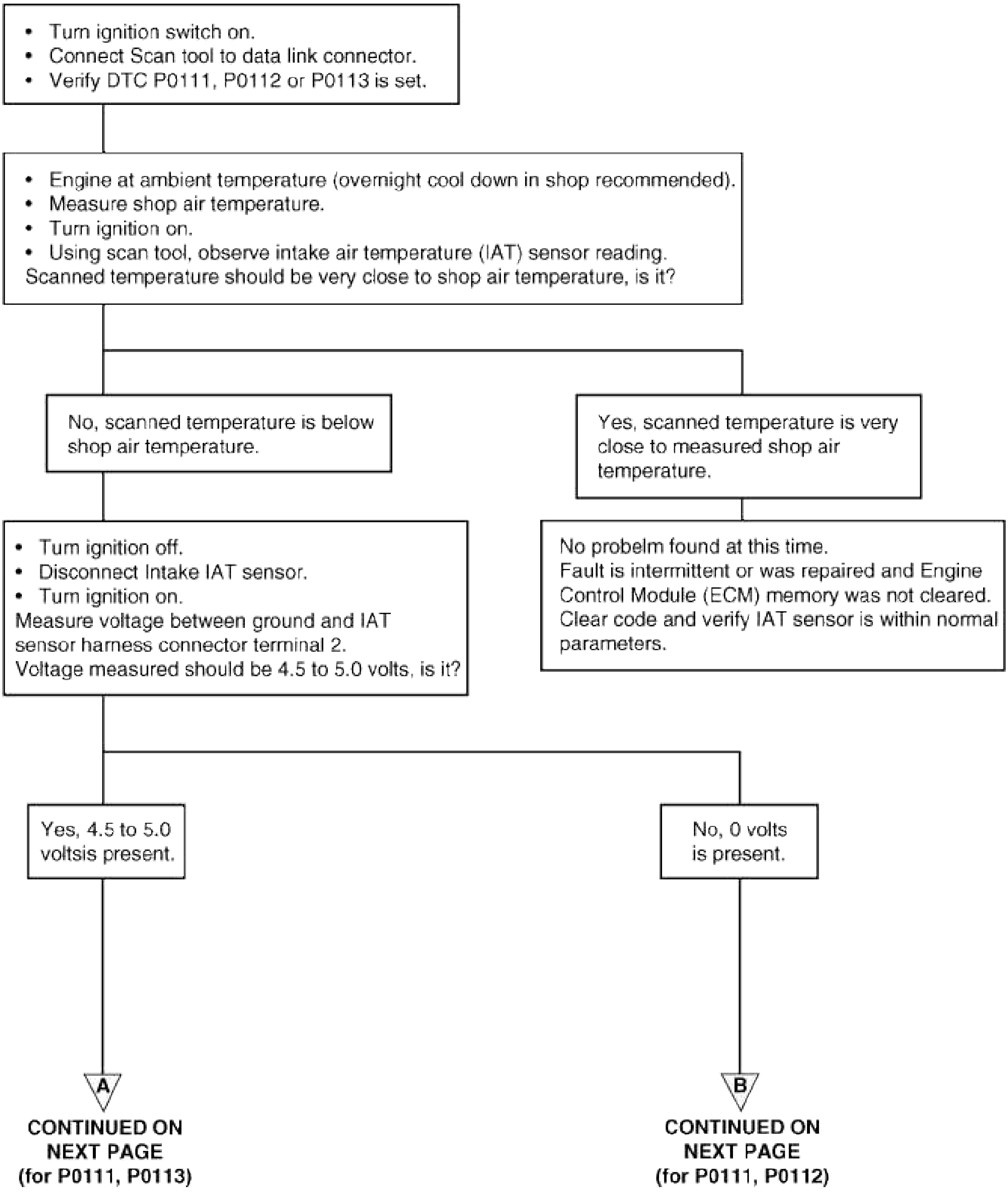
The ECM will set P0112 and the Malfunction Indicator Lamp (MIL) will turn on if the IAT sensor indicates a temperature lower than -49°F (-45°C) for 0.2 seconds during two driving cycles. This check is made after the engine has run for 4 minutes and 10 seconds and then idles for 30 seconds (with no fuel cut-off during a coast-down). This code indicates a lower than expected temperature is being read by the IAT sensor or ECM after the engine has been warmed up.

CIRCUIT DIAGRAM


MAP
sensor
MAP
IAT
2
3
4
1
33
42
36
37
Sensor
power
IAT
signal
Sensor
ground
MAP
signal
E C M

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn ignition switch on.
- Connect Scan tool to data link connector.
- Verify DTC P0111, P0112 or P0113 is set.

- Engine at ambient temperature (overnight cool down in shop recommended).
- Measure shop air temperature.
- Turn ignition on.
- Using scan tool, observe intake air temperature (IAT) sensor reading.

Scanned temperature should be very close to shop air temperature, is it?

No, scanned temperature is below shop air temperature.

Yes, scanned temperature is very close to measured shop air temperature.

- Turn ignition off.
- Disconnect Intake IAT sensor.
- Turn ignition on.

Measure voltage between ground and IAT sensor harness connector terminal 2.
Voltage measured should be 4.5 to 5.0 volts, is it?

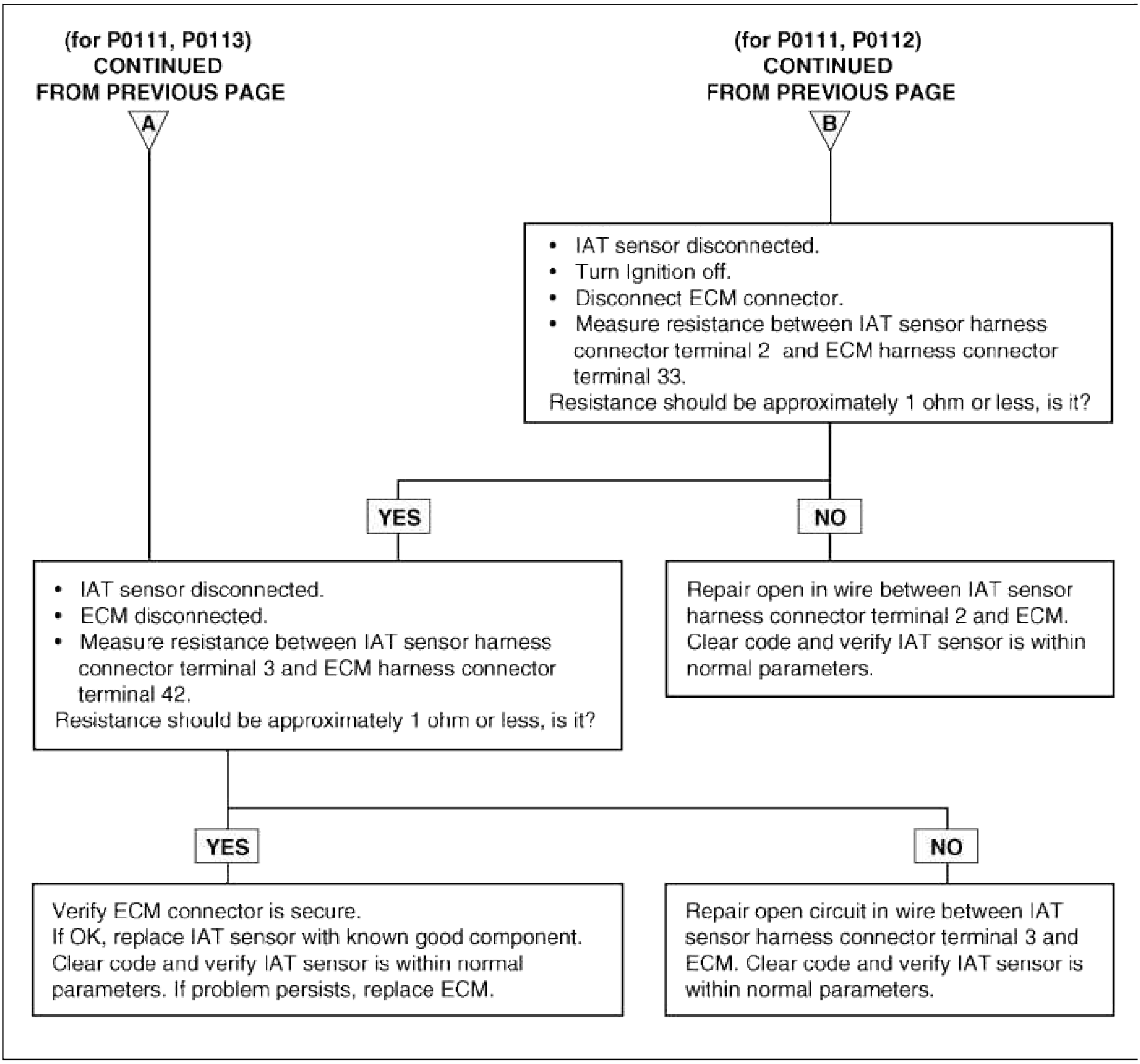
No probelm found at this time.
Fault is intermittent or was repaired and Engine Control Module (ECM) memory was not cleared.
Clear code and verify IAT sensor is within normal parameters.

Yes, 4.5 to 5.0 voltsis present.

No, 0 volts is present.

CONTINUED ON
NEXT PAGE
(for P0111, P0113)

CONTINUED ON
NEXT PAGE
(for P0111, P0112)


(for P0111, P0113) CONTINUED FROM PREVIOUS PAGE
A
(for P0111, P0112) CONTINUED FROM PREVIOUS PAGE
B
• IAT sensor disconnected.
• Turn Ignition off.
• Disconnect ECM connector.
• Measure resistance between IAT sensor harness connector terminal 2 and ECM harness connector terminal 33.
Resistance should be approximately 1 ohm or less, is it?
YES
NO
• IAT sensor disconnected.
• ECM disconnected.
• Measure resistance between IAT sensor harness connector terminal 3 and ECM harness connector terminal 42.
Resistance should be approximately 1 ohm or less, is it?
Repair open in wire between IAT sensor harness connector terminal 2 and ECM. Clear code and verify IAT sensor is within normal parameters.
YES
NO
Verify ECM connector is secure. If OK, replace IAT sensor with known good component. Clear code and verify IAT sensor is within normal parameters. If problem persists, replace ECM.
Repair open circuit in wire between IAT sensor harness connector terminal 3 and ECM. Clear code and verify IAT sensor is within normal parameters.

Fuel System > Troubleshooting > P0112

[P0111/P0112/P0113]

DTC	Diagnostic item
P0111 P0112 P0113	Intake Air Temperature Circuit Range/Performance Intake Air Temperature Low Input Intake Air Temperature High Input

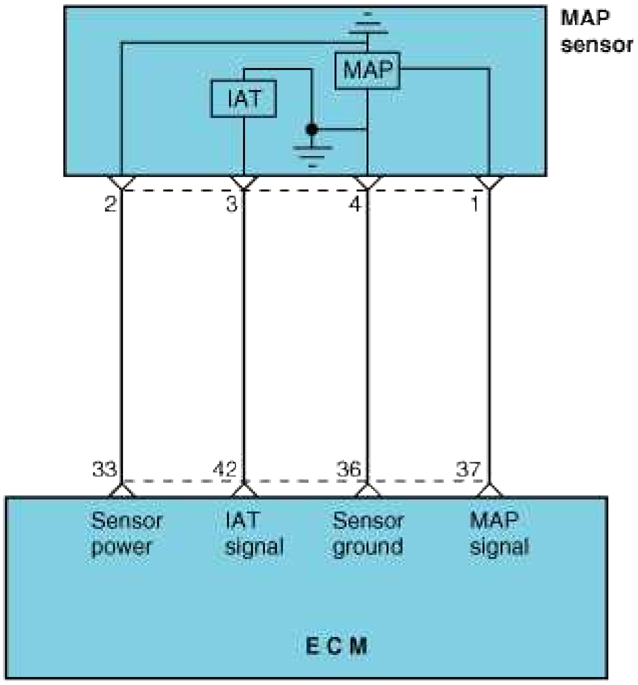
DESCRIPTION

The Intake air temperature (IAT) sensor is built-in to the MAP sensor. The IAT sensor is a variable resistor whose resistance changes as the temperature of the air flowing through the air intake changes. The Engine Control Module (ECM) uses the IAT sensor input to adjust fuel injector pulse width. When the temperature sensed is cold, the ECM enriches fuel mixture by increasing injector pulse width; as the air warms, the injector pulse width time is shortened.

FAILURE CONDITIONS

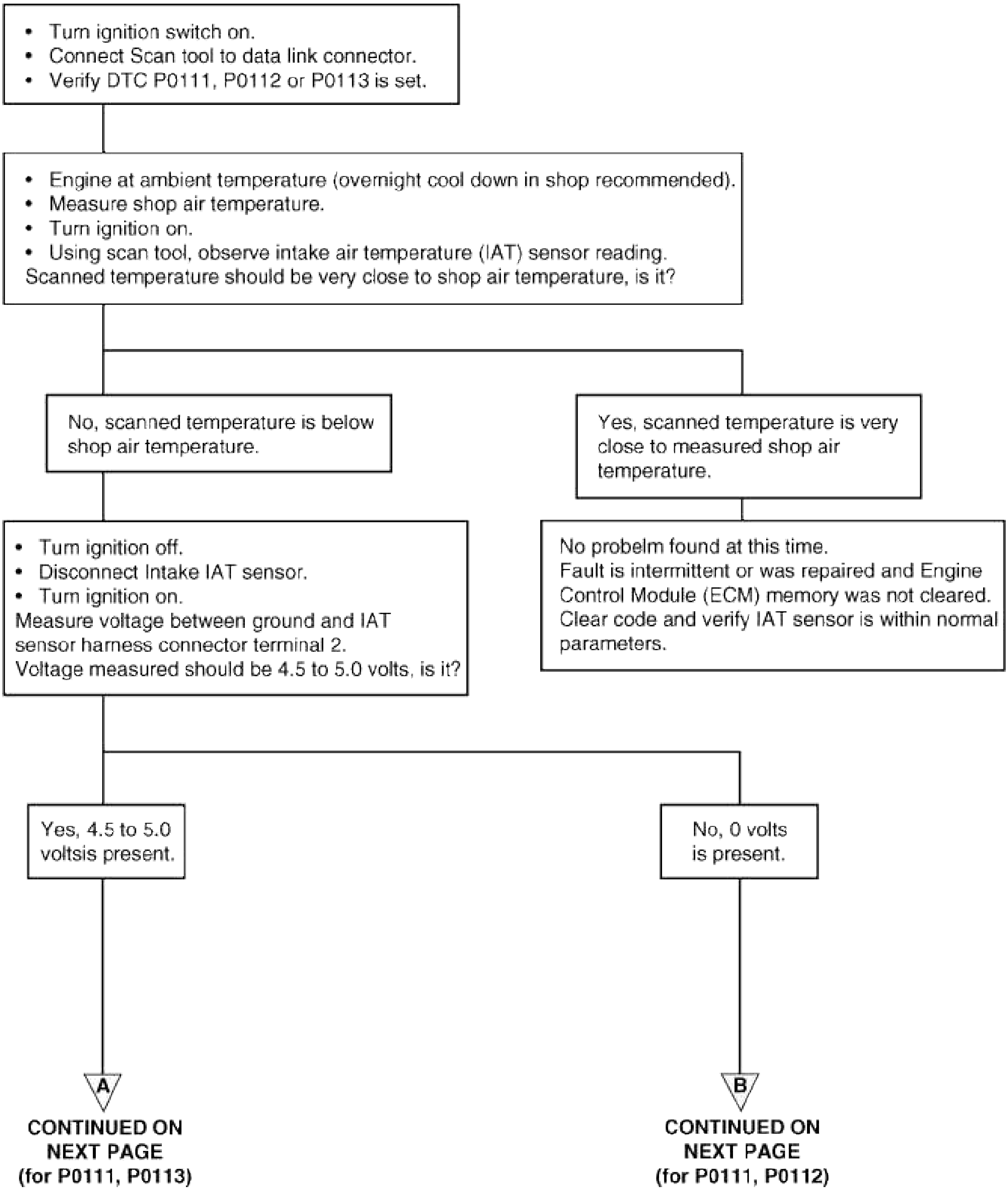
The ECM will set P0112 and the Malfunction Indicator Lamp (MIL) will turn on if the IAT sensor indicates a temperature lower than -49°F (-45°C) for 0.2 seconds during two driving cycles. This check is made after the engine has run for 4 minutes and 10 seconds and then idles for 30 seconds (with no fuel cut-off during a coast-down). This code indicates a lower than expected temperature is being read by the IAT sensor or ECM after the engine has been warmed up.

CIRCUIT DIAGRAM


MAP
sensor
MAP
IAT
2
3
4
1
33
42
36
37
Sensor
power
IAT
signal
Sensor
ground
MAP
signal
E C M

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn ignition switch on.
- Connect Scan tool to data link connector.
- Verify DTC P0111, P0112 or P0113 is set.

- Engine at ambient temperature (overnight cool down in shop recommended).
- Measure shop air temperature.
- Turn ignition on.
- Using scan tool, observe intake air temperature (IAT) sensor reading.

Scanned temperature should be very close to shop air temperature, is it?

No, scanned temperature is below shop air temperature.

Yes, scanned temperature is very close to measured shop air temperature.

- Turn ignition off.
- Disconnect Intake IAT sensor.
- Turn ignition on.

Measure voltage between ground and IAT sensor harness connector terminal 2.
Voltage measured should be 4.5 to 5.0 volts, is it?

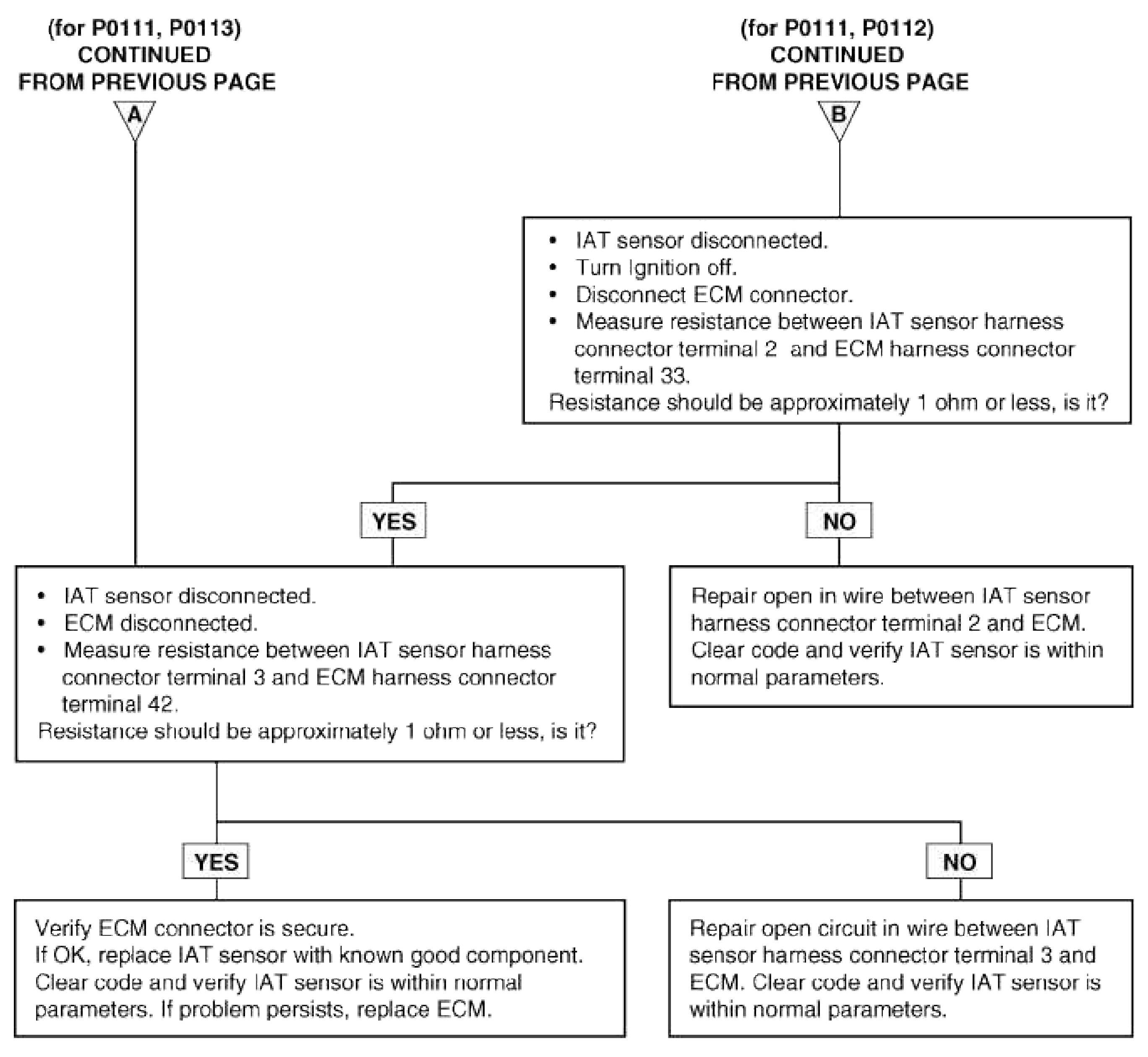
No probelm found at this time.
Fault is intermittent or was repaired and Engine Control Module (ECM) memory was not cleared.
Clear code and verify IAT sensor is within normal parameters.

Yes, 4.5 to 5.0 voltsis present.

No, 0 volts is present.

CONTINUED ON NEXT PAGE (for P0111, P0113)

CONTINUED ON NEXT PAGE (for P0111, P0112)



(for P0111, P0113)
CONTINUED
FROM PREVIOUS PAGE

(for P0111, P0112)
CONTINUED
FROM PREVIOUS PAGE

- IAT sensor disconnected.
- Turn Ignition off.
- Disconnect ECM connector.
- Measure resistance between IAT sensor harness connector terminal 2 and ECM harness connector terminal 33.

Resistance should be approximately 1 ohm or less, is it?

- IAT sensor disconnected.
- ECM disconnected.
- Measure resistance between IAT sensor harness connector terminal 3 and ECM harness connector terminal 42.

Resistance should be approximately 1 ohm or less, is it?

Repair open in wire between IAT sensor harness connector terminal 2 and ECM. Clear code and verify IAT sensor is within normal parameters.

Verify ECM connector is secure. If OK, replace IAT sensor with known good component. Clear code and verify IAT sensor is within normal parameters. If problem persists, replace ECM.

Repair open circuit in wire between IAT sensor harness connector terminal 3 and ECM. Clear code and verify IAT sensor is within normal parameters.

Fuel System > Troubleshooting > P0113

[P0112/P0113]

DTC	Diagnostic item
P0112 P0113	Intake Air Temperature Low Input Intake Air Temperature High Input

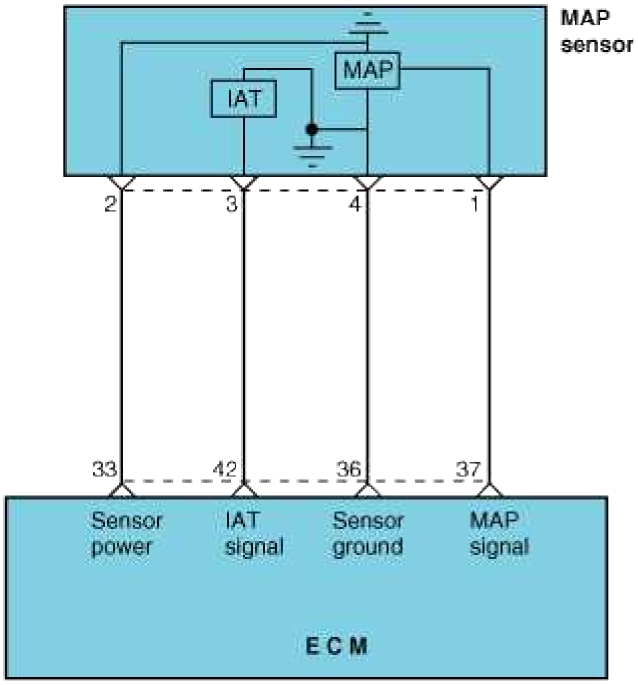
DESCRIPTION

The Intake air temperature (IAT) sensor is built-in to the MAP sensor. The IAT sensor is a variable resistor whose resistance changes as the temperature of the air flowing through the air intake changes. The Engine Control Module (ECM) uses the IAT sensor input to adjust fuel injector pulse width. When the temperature sensed is cold, the ECM enriches fuel mixture by increasing injector pulse width; as the air warms, the injector pulse width time is shortened.

FAILURE CONDITIONS

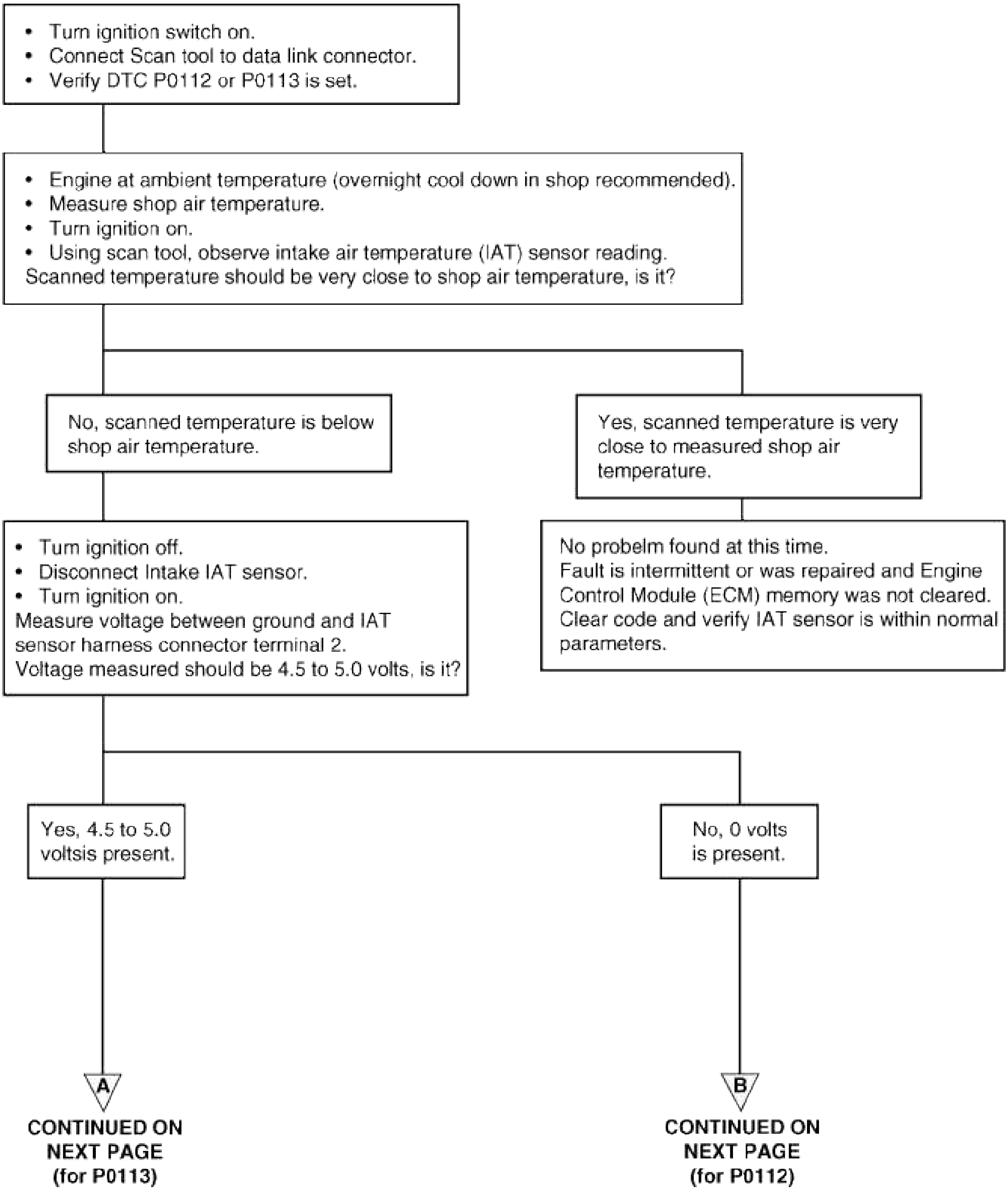
The ECM will set P0112 and the Malfunction Indicator Lamp (MIL) will turn on if the IAT sensor indicates a temperature lower than -49°F (-45°C) for 0.2 seconds during two driving cycles. This check is made after the engine has run for 4 minutes and 10 seconds and then idles for 30 seconds (with no fuel cut-off during a coast-down). This code indicates a lower than expected temperature is being read by the IAT sensor or ECM after the engine has been warmed up.

CIRCUIT DIAGRAM


MAP sensor
MAP
IAT
2
3
4
1
33
42
36
37
Sensor power
IAT signal
Sensor ground
MAP signal
E C M

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn ignition switch on.
- Connect Scan tool to data link connector.
- Verify DTC P0112 or P0113 is set.

- Engine at ambient temperature (overnight cool down in shop recommended).
- Measure shop air temperature.
- Turn ignition on.
- Using scan tool, observe intake air temperature (IAT) sensor reading.

Scanned temperature should be very close to shop air temperature, is it?

No, scanned temperature is below shop air temperature.

Yes, scanned temperature is very close to measured shop air temperature.

- Turn ignition off.
- Disconnect Intake IAT sensor.
- Turn ignition on.

Measure voltage between ground and IAT sensor harness connector terminal 2.
Voltage measured should be 4.5 to 5.0 volts, is it?

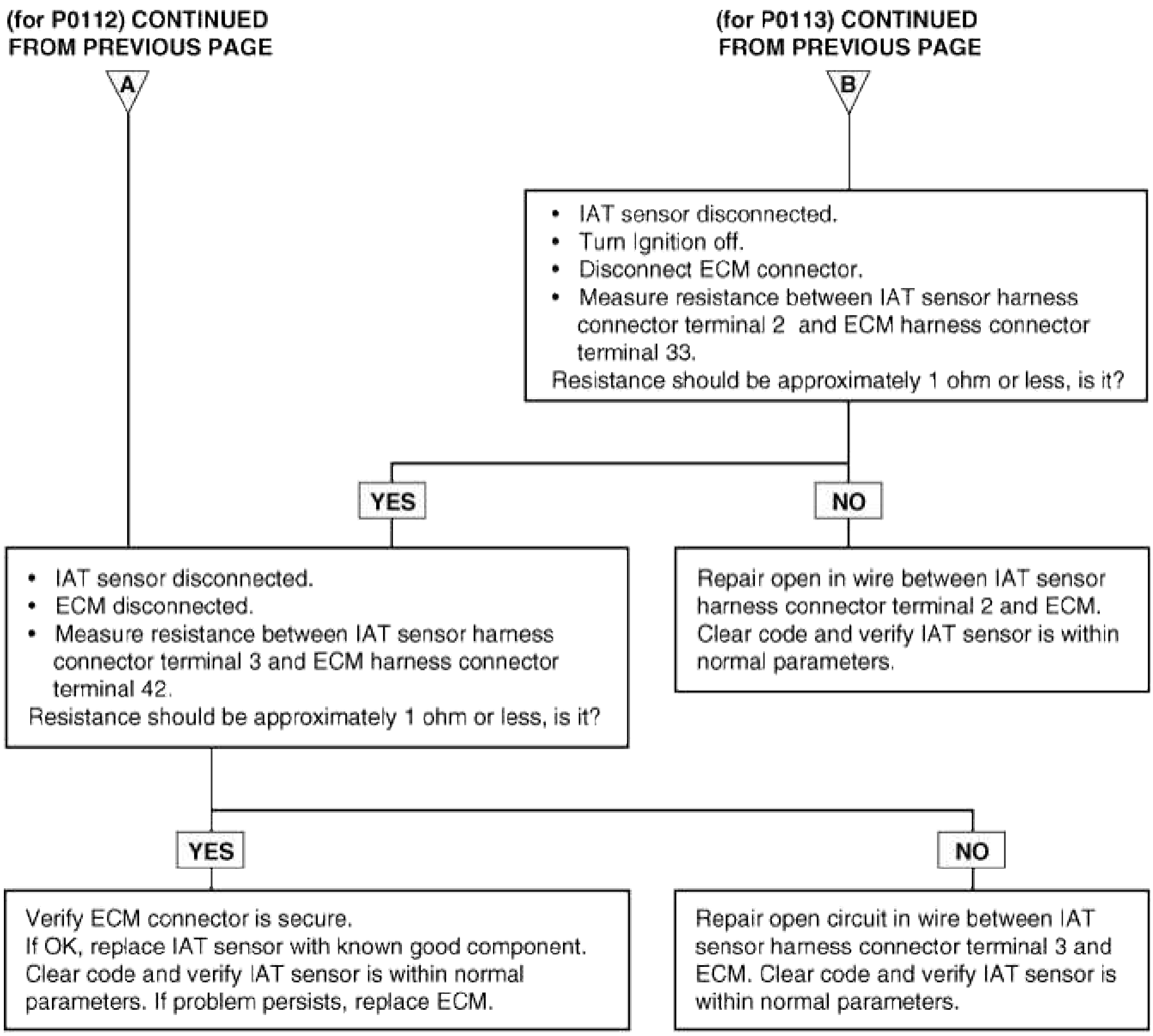
No probelm found at this time.
Fault is intermittent or was repaired and Engine Control Module (ECM) memory was not cleared.
Clear code and verify IAT sensor is within normal parameters.

Yes, 4.5 to 5.0 voltsis present.

No, 0 volts is present.

CONTINUED ON NEXT PAGE (for P0113)

CONTINUED ON NEXT PAGE (for P0112)



(for P0112) CONTINUED FROM PREVIOUS PAGE

(for P0113) CONTINUED FROM PREVIOUS PAGE

- IAT sensor disconnected.
- Turn Ignition off.
- Disconnect ECM connector.
- Measure resistance between IAT sensor harness connector terminal 2 and ECM harness connector terminal 33.

Resistance should be approximately 1 ohm or less, is it?

Repair open in wire between IAT sensor harness connector terminal 2 and ECM. Clear code and verify IAT sensor is within normal parameters.

- IAT sensor disconnected.
- ECM disconnected.
- Measure resistance between IAT sensor harness connector terminal 3 and ECM harness connector terminal 42.

Resistance should be approximately 1 ohm or less, is it?

Verify ECM connector is secure. If OK, replace IAT sensor with known good component. Clear code and verify IAT sensor is within normal parameters. If problem persists, replace ECM.

Repair open circuit in wire between IAT sensor harness connector terminal 3 and ECM. Clear code and verify IAT sensor is within normal parameters.

Fuel System > Troubleshooting > P0116

[P0116/P0117/P0118]

DTC	Diagnostic item
P0116 P0117 P0118	Engine Coolant Temperature Circuit Range/Performance Problem Engine Coolant Temperature Low Input Engine Coolant Temperature High Input

DESCRIPTION

The Engine Coolant Temperature (ECT) sensor is located in the coolant passage of the cylinder head. The ECT sensor is a variable resistor whose resistance changes as the temperature of the engine coolant flowing past the sensor changes. When coolant temperature is low, sensor resistance is high; when coolant temperature is high, sensor resistance is low.

The Engine Control Module (ECM) checks ECT sensor voltage and uses the information to adjust fuel injector pulse width and ignition timing. When the temperature sensed is very cold, the ECM enriches the fuel mixture and advances ignition timing. As coolant temperature rises, the ECM reduces the amount of enrichment and timing advance.

FAILURE CONDITIONS

The ECM will set P0116 and the Malfunction Indicator Lamp (MIL) will turn on if the ECT sensor's actual performance curve falls more than 68°F (20°C) below the ECM's modal curve (based on fuel delivery, ambient air temperature and engine running time) for 0.2 seconds during two driving cycles. This code indicates uncharacteristic engine temperature performance being read by the ECT sensor or ECM.

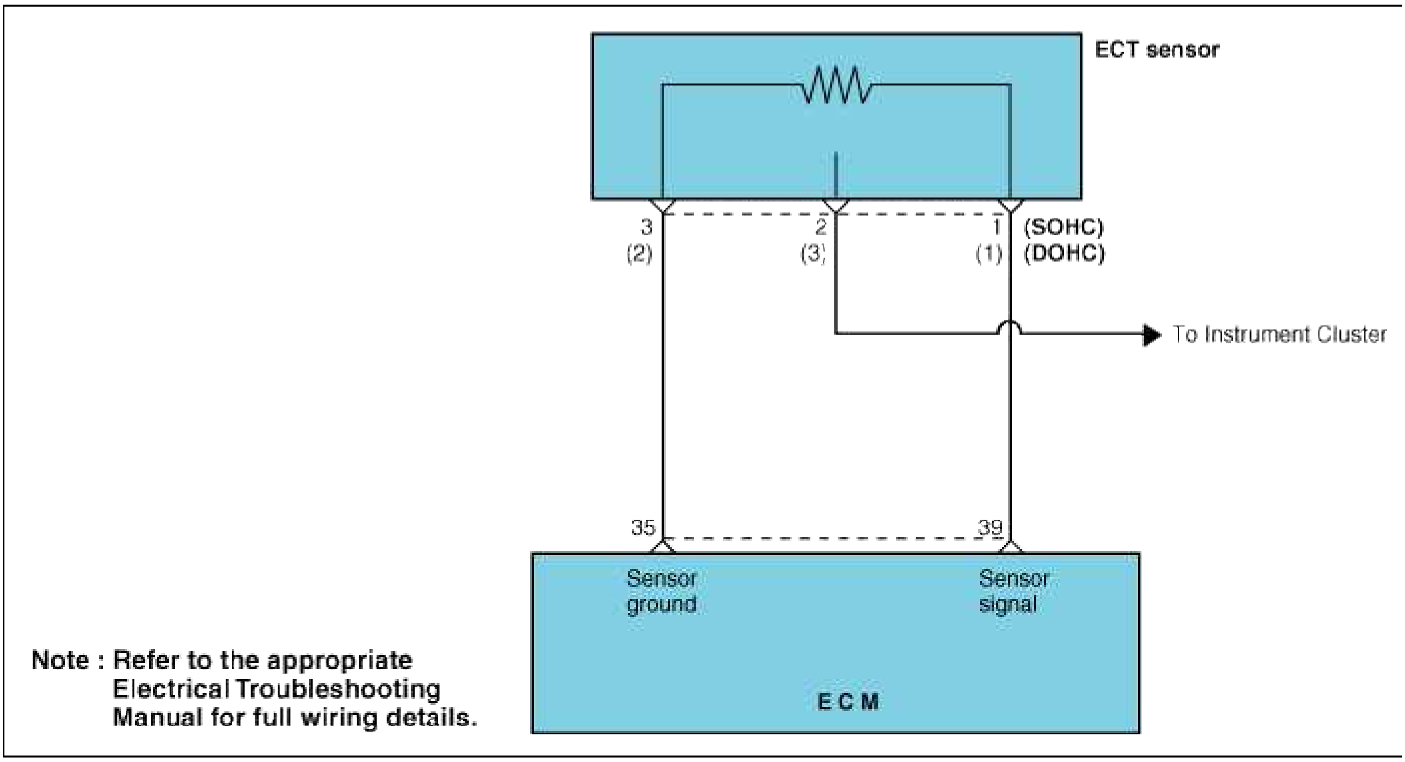
The ECM will set P0117 and the Malfunction Indicator Lamp (MIL) will turn on if the ECT sensor reports a temperature below -49°F (-45°C) for 0.2 seconds during two driving cycles. The ECM will set P0118 and the MalfunctionIndicator Lamp (MIL) will turn on if the ECT sensor reports a temperature above 284°F (140°C) for 0.2 seconds during two driving cycles.

NOTE

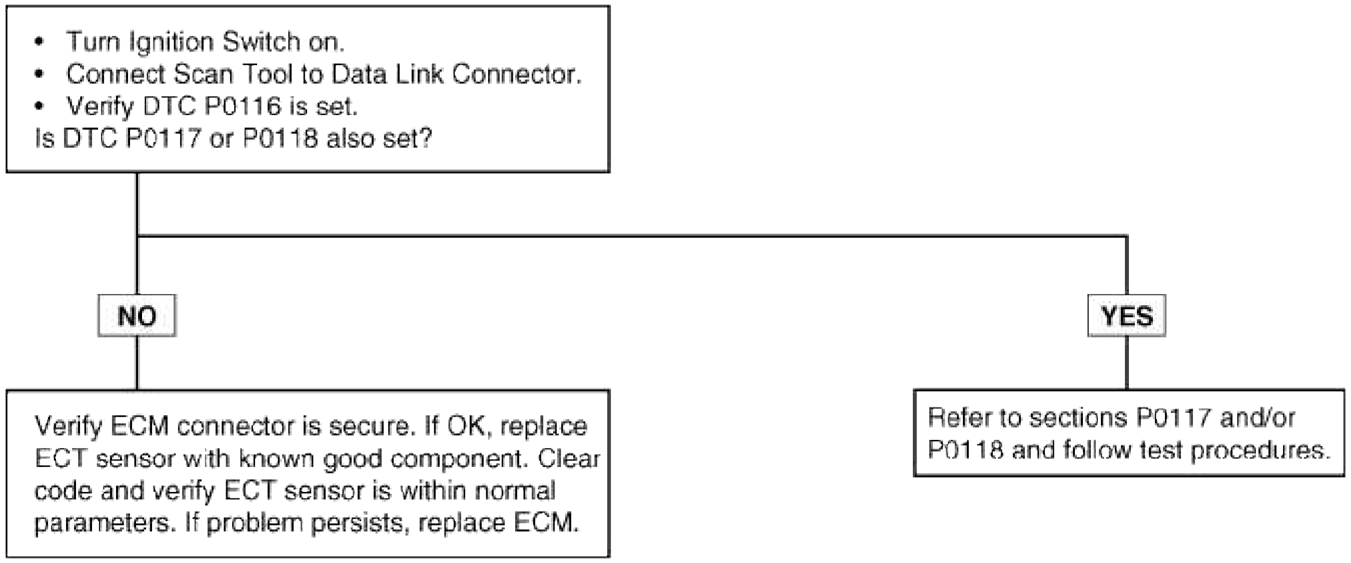
The ECT sensor resistance varies with temperature as follows :

- 5900 ohms @ 32°F (0°C).
- 2500 ohms @ 68°F (20°C).
- 300 ohms @ 176°F (80°C).

CIRCUIT DIAGRAM


ECT sensor
3
(2)
2
(3)
1
(1)
(SOHC)
(DOHC)
To Instrument Cluster
35
39
Sensor ground
Sensor signal
ECM
Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE

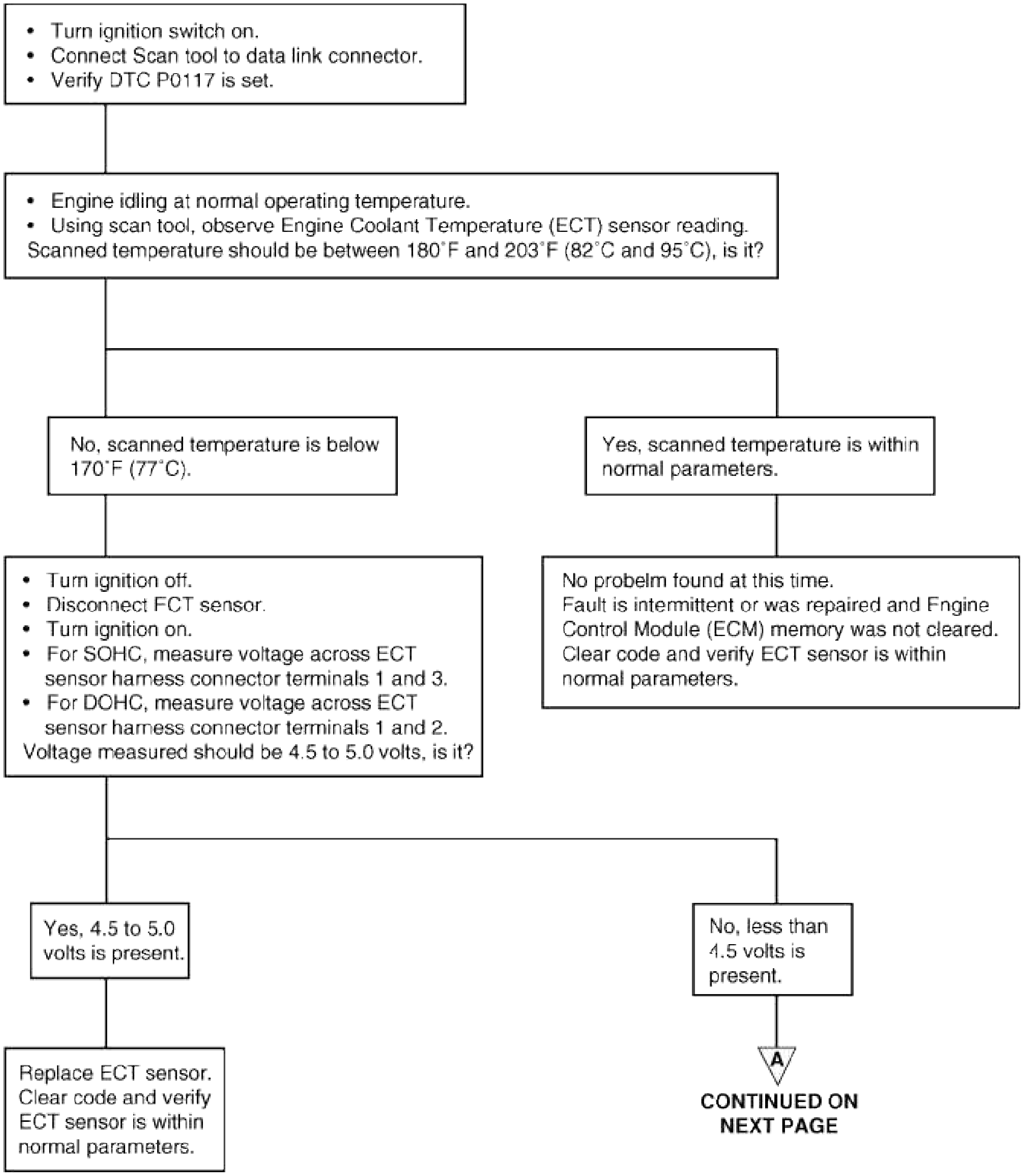


- Turn Ignition Switch on.
- Connect Scan Tool to Data Link Connector.
- Verify DTC P0116 is set.

Is DTC P0117 or P0118 also set?

Verify ECM connector is secure. If OK, replace ECT sensor with known good component. Clear code and verify ECT sensor is within normal parameters. If problem persists, replace ECM.

Refer to sections P0117 and/or P0118 and follow test procedures.



- Turn ignition switch on.
- Connect Scan tool to data link connector.
- Verify DTC P0117 is set.

- Engine idling at normal operating temperature.
- Using scan tool, observe Engine Coolant Temperature (ECT) sensor reading.

Scanned temperature should be between 180°F and 203°F (82°C and 95°C), is it?

No, scanned temperature is below 170°F (77°C).

- Turn ignition off.
- Disconnect ECT sensor.
- Turn ignition on.
- For SOHC, measure voltage across ECT sensor harness connector terminals 1 and 3.
- For DOHC, measure voltage across ECT sensor harness connector terminals 1 and 2.

Voltage measured should be 4.5 to 5.0 volts, is it?

Yes, 4.5 to 5.0 volts is present.

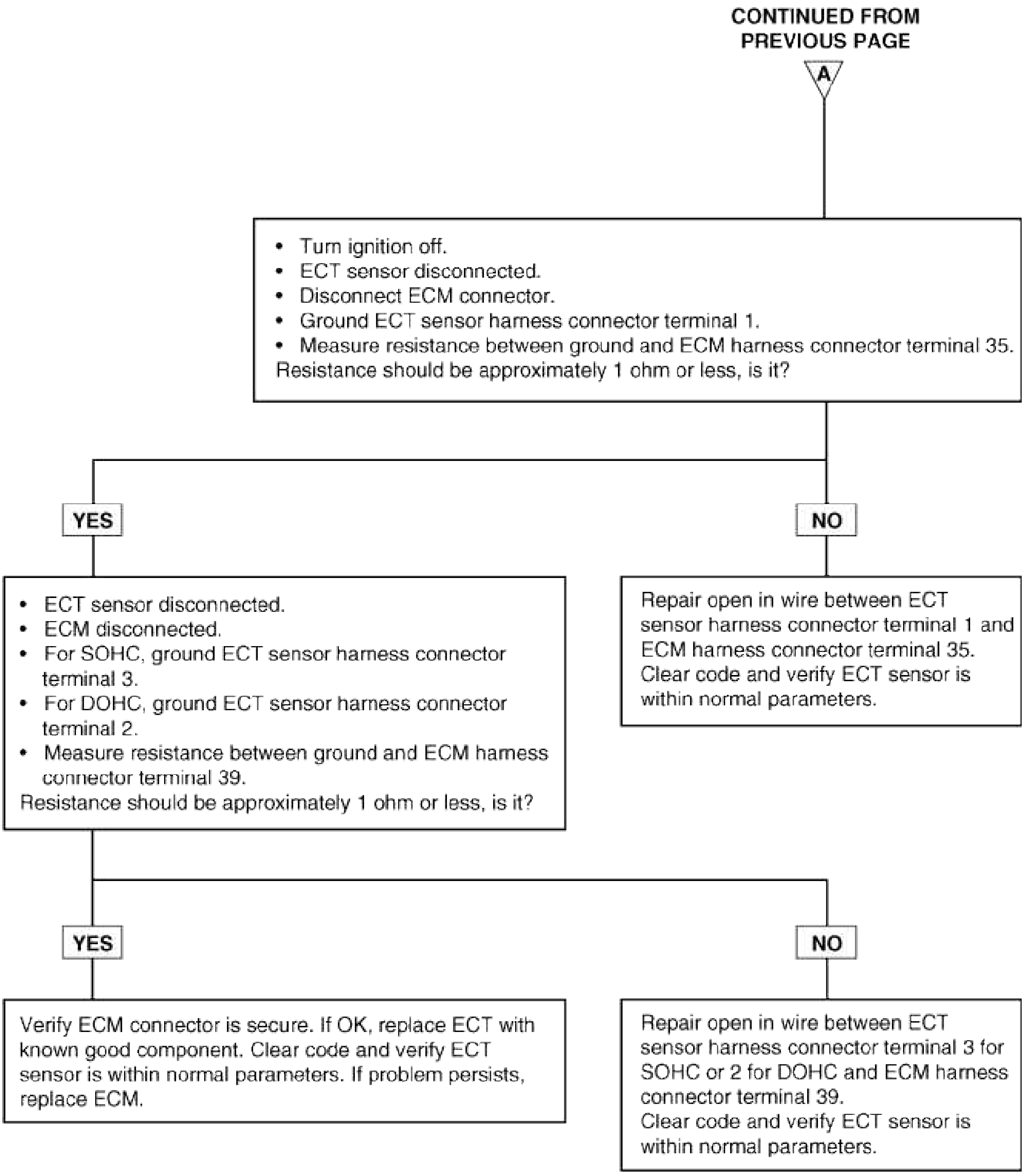
Replace ECT sensor. Clear code and verify ECT sensor is within normal parameters.

No, less than 4.5 volts is present.

CONTINUED ON NEXT PAGE

Yes, scanned temperature is within normal parameters.

No probelm found at this time. Fault is intermittent or was repaired and Engine Control Module (ECM) memory was not cleared. Clear code and verify ECT sensor is within normal parameters.



CONTINUED FROM PREVIOUS PAGE

- Turn ignition off.
- ECT sensor disconnected.
- Disconnect ECM connector.
- Ground ECT sensor harness connector terminal 1.
- Measure resistance between ground and ECM harness connector terminal 35.

Resistance should be approximately 1 ohm or less, is it?

YES

- ECT sensor disconnected.
- ECM disconnected.
- For SOHC, ground ECT sensor harness connector terminal 3.
- For DOHC, ground ECT sensor harness connector terminal 2.
- Measure resistance between ground and ECM harness connector terminal 39.

Resistance should be approximately 1 ohm or less, is it?

YES

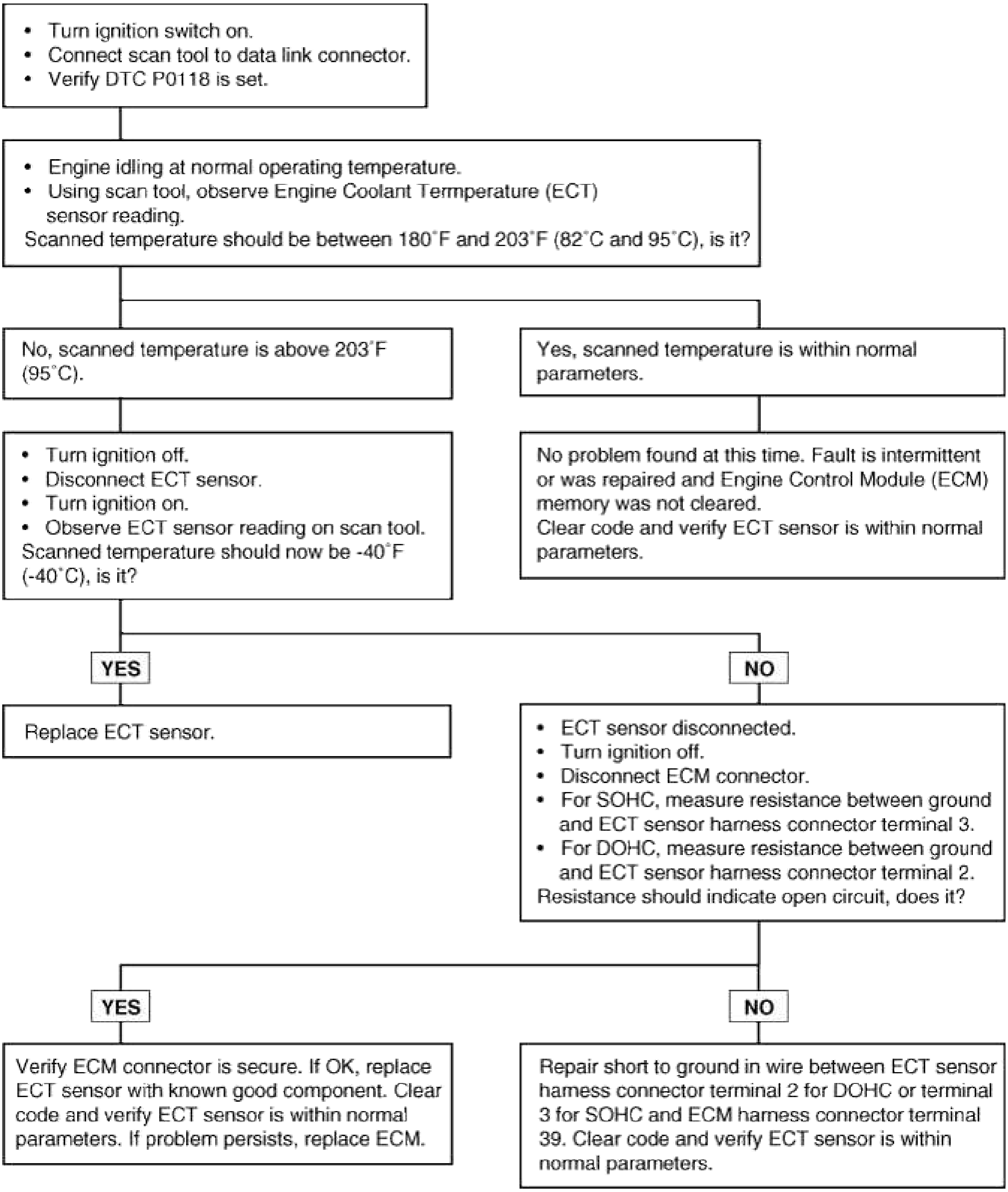
Verify ECM connector is secure. If OK, replace ECT with known good component. Clear code and verify ECT sensor is within normal parameters. If problem persists, replace ECM.

NO

Repair open in wire between ECT sensor harness connector terminal 3 for SOHC or 2 for DOHC and ECM harness connector terminal 39.
Clear code and verify ECT sensor is within normal parameters.

NO

Repair open in wire between ECT sensor harness connector terminal 1 and ECM harness connector terminal 35.
Clear code and verify ECT sensor is within normal parameters.



- Turn ignition switch on.
- Connect scan tool to data link connector.
- Verify DTC P0118 is set.

- Engine idling at normal operating temperature.
- Using scan tool, observe Engine Coolant Termperature (ECT) sensor reading.

Scanned temperature should be between 180˚F and 203˚F (82˚C and 95˚C), is it?

No, scanned temperature is above 203˚F (95˚C).

- Turn ignition off.
- Disconnect ECT sensor.
- Turn ignition on.
- Observe ECT sensor reading on scan tool.

Scanned temperature should now be -40˚F (-40˚C), is it?

YES

Replace ECT sensor.

NO

- ECT sensor disconnected.
- Turn ignition off.
- Disconnect ECM connector.
- For SOHC, measure resistance between ground and ECT sensor harness connector terminal 3.
- For DOHC, measure resistance between ground and ECT sensor harness connector terminal 2.

Resistance should indicate open circuit, does it?

YES

Verify ECM connector is secure. If OK, replace ECT sensor with known good component. Clear code and verify ECT sensor is within normal parameters. If problem persists, replace ECM.

NO

Repair short to ground in wire between ECT sensor harness connector terminal 2 for DOHC or terminal 3 for SOHC and ECM harness connector terminal 39. Clear code and verify ECT sensor is within normal parameters.

Yes, scanned temperature is within normal parameters.

No problem found at this time. Fault is intermittent or was repaired and Engine Control Module (ECM) memory was not cleared.
Clear code and verify ECT sensor is within normal parameters.

Fuel System > Troubleshooting > P0117

[P0116/P0117/P0118]

DTC	Diagnostic item
P0116	Engine Coolant Temperature Circuit Range/Performance Problem
P0117	Engine Coolant Temperature Low Input
P0118	Engine Coolant Temperature High Input

DESCRIPTION

The Engine Coolant Temperature (ECT) sensor is located in the coolant passage of the cylinder head. The ECT sensor is a variable resistor whose resistance changes as the temperature of the engine coolant flowing past the sensor changes.When coolant temperature is low, sensor resistance is high; when coolant temperature is high, sensor resistance is low.

The Engine Control Module (ECM) checks ECT sensor voltage and uses the information to adjust fuel injector pulse width and ignition timing. When the temperature sensed is very cold, the ECM enriches the fuel mixture and advances ignition timing. As coolant temperature rises, the ECM reduces the amount of enrichment and timing advance.

FAILURE CONDITIONS

The ECM will set P0116 and the Malfunction Indicator Lamp (MIL) will turn on if the ECT sensor's actual performance curve falls more than 68°F (20°C) below the ECM's modal curve (based on fuel delivery, ambient air temperature and engine running time) for 0.2 seconds during two driving cycles. This code indicates uncharacteristic engine temperature performance being read by the ECT sensor or ECM.

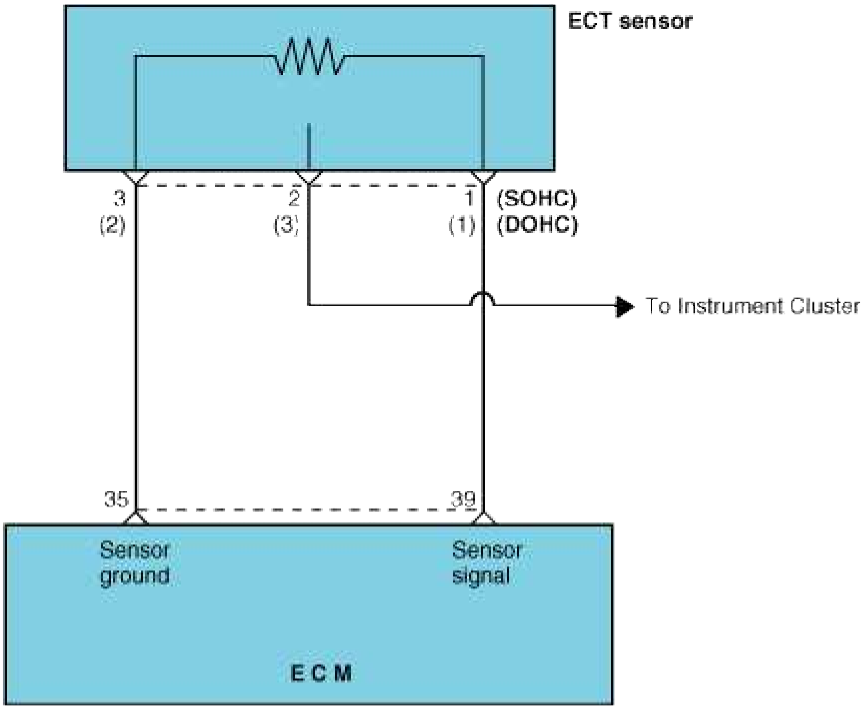
The ECM will set P0117 and the Malfunction Indicator Lamp (MIL) will turn on if the ECT sensor reports a temperature below -49°F (-45°C) for 0.2 seconds during two driving cycles. The ECM will set P0118 and the MalfunctionIndicator Lamp (MIL) will turn on if the ECT sensor reports a temperature above 284°F (140°C) for 0.2 seconds during two driving cycles.

NOTE

The ECT sensor resistance varies with temperature as follows :

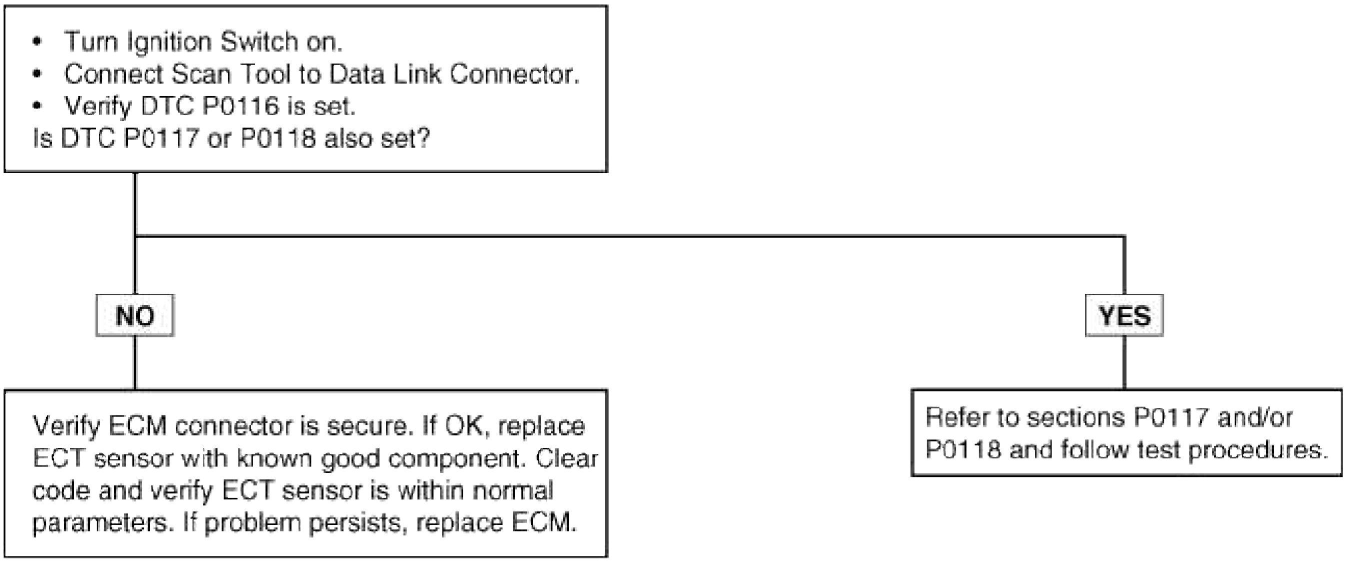
- 5900 ohms @ 32°F (0°C).
- 2500 ohms @ 68°F (20°C).
- 300 ohms @ 176°F (80°C).

CIRCUIT DIAGRAM


ECT sensor
3
(2)
2
(3)
1
(1)
(SOHC)
(DOHC)
To Instrument Cluster
35
39
Sensor ground
Sensor signal
E C M

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

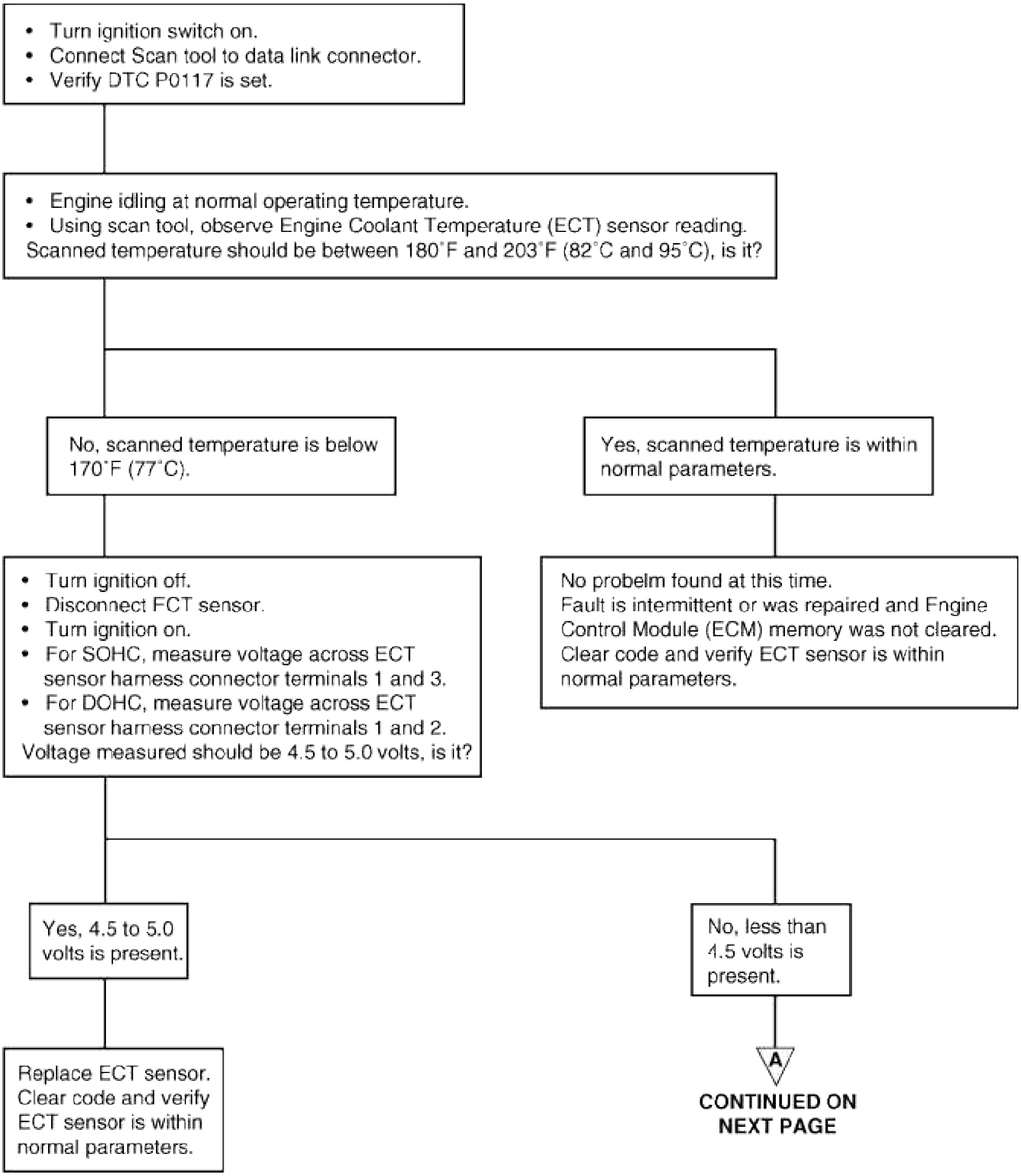
TEST PROCEDURE


- Turn Ignition Switch on.
- Connect Scan Tool to Data Link Connector.
- Verify DTC P0116 is set.

Is DTC P0117 or P0118 also set?

Verify ECM connector is secure. If OK, replace ECT sensor with known good component. Clear code and verify ECT sensor is within normal parameters. If problem persists, replace ECM.

Refer to sections P0117 and/or P0118 and follow test procedures.



- Turn ignition switch on.
- Connect Scan tool to data link connector.
- Verify DTC P0117 is set.

- Engine idling at normal operating temperature.
- Using scan tool, observe Engine Coolant Temperature (ECT) sensor reading.

Scanned temperature should be between 180°F and 203°F (82°C and 95°C), is it?

No, scanned temperature is below 170°F (77°C).

Yes, scanned temperature is within normal parameters.

- Turn ignition off.
- Disconnect ECT sensor.
- Turn ignition on.
- For SOHC, measure voltage across ECT sensor harness connector terminals 1 and 3.
- For DOHC, measure voltage across ECT sensor harness connector terminals 1 and 2.

Voltage measured should be 4.5 to 5.0 volts, is it?

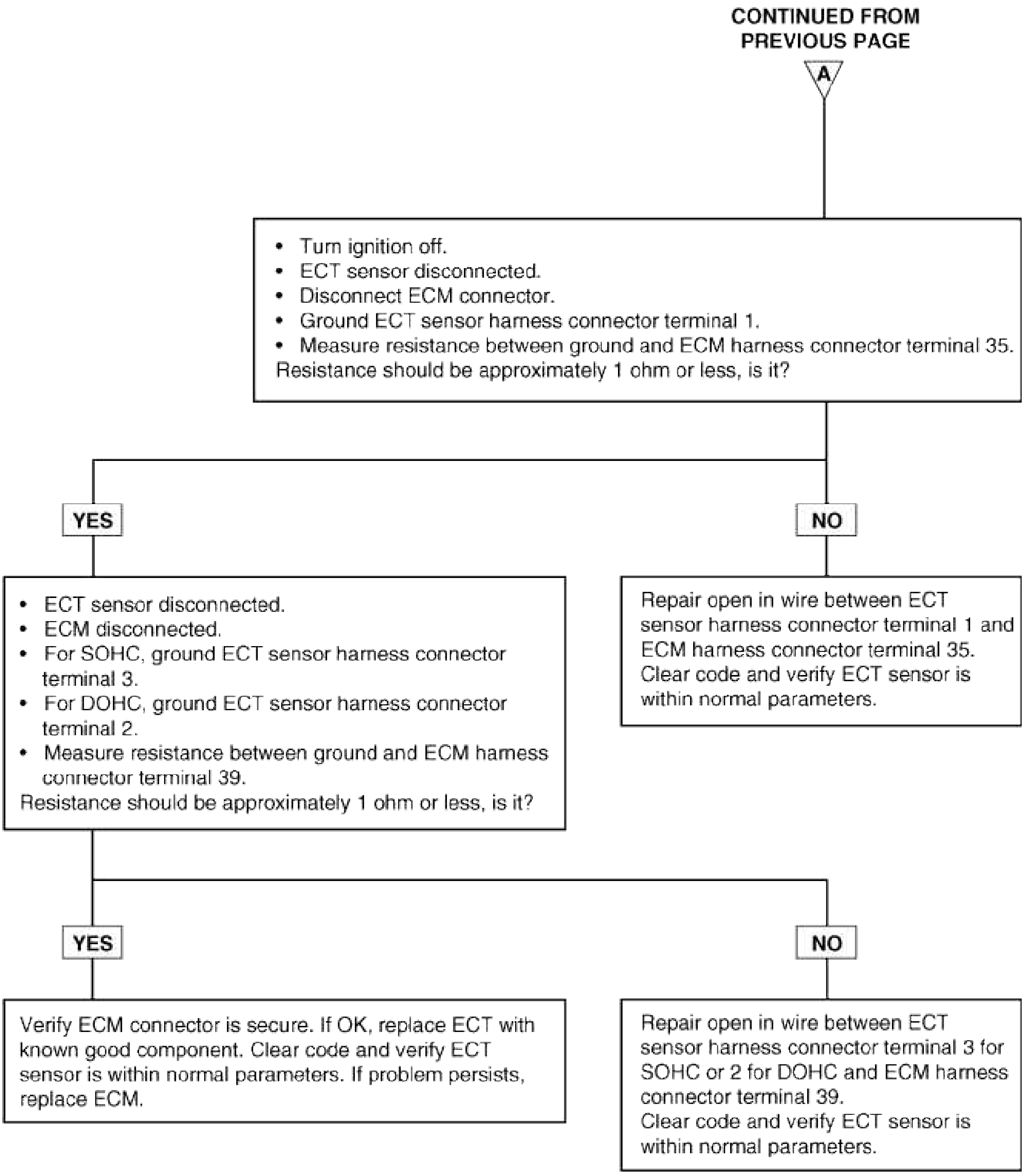
No probelm found at this time. Fault is intermittent or was repaired and Engine Control Module (ECM) memory was not cleared. Clear code and verify ECT sensor is within normal parameters.

Yes, 4.5 to 5.0 volts is present.

No, less than 4.5 volts is present.

Replace ECT sensor. Clear code and verify ECT sensor is within normal parameters.

CONTINUED ON NEXT PAGE



- Turn ignition off.
- ECT sensor disconnected.
- Disconnect ECM connector.
- Ground ECT sensor harness connector terminal 1.
- Measure resistance between ground and ECM harness connector terminal 35.

Resistance should be approximately 1 ohm or less, is it?

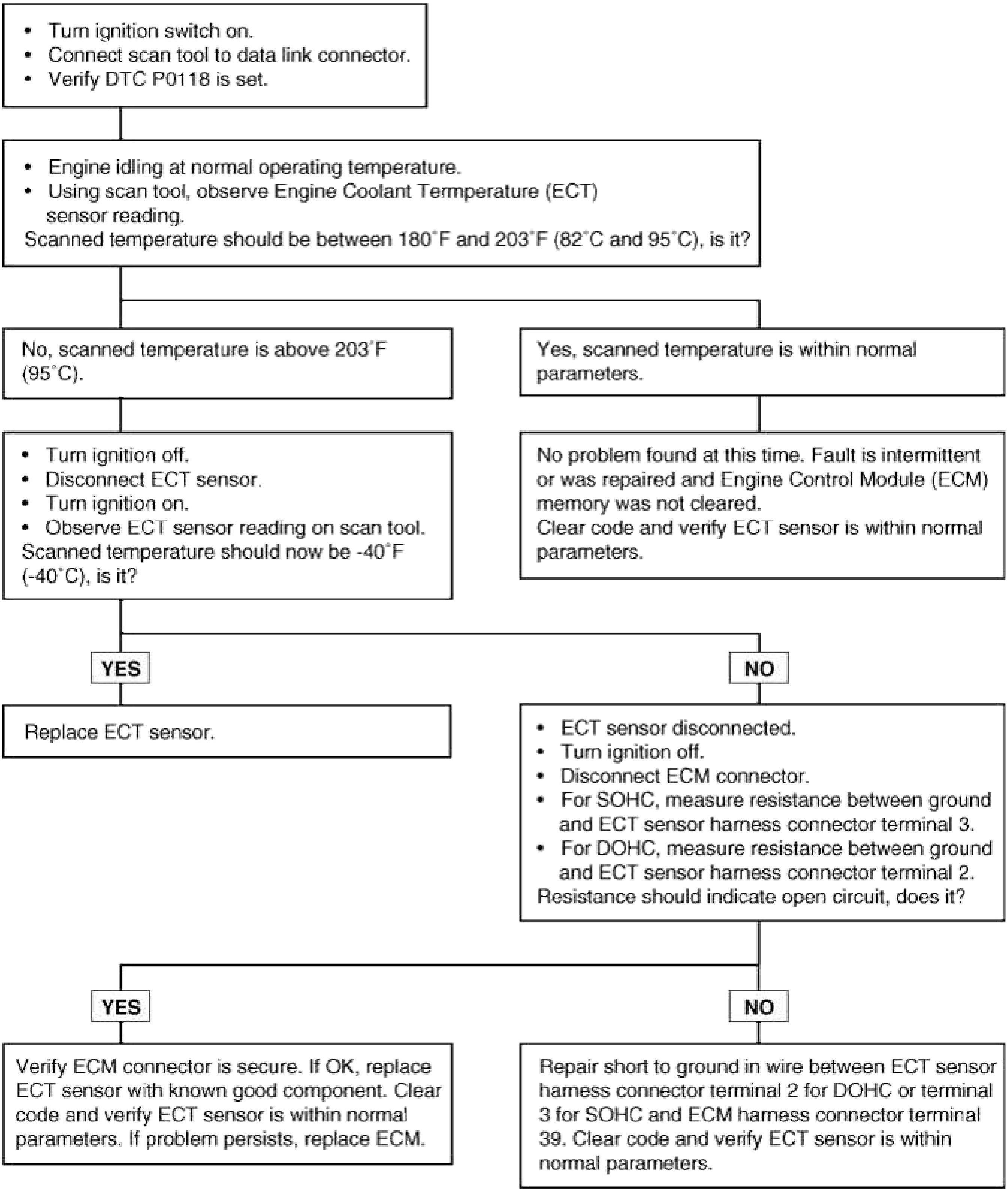
- ECT sensor disconnected.
- ECM disconnected.
- For SOHC, ground ECT sensor harness connector terminal 3.
- For DOHC, ground ECT sensor harness connector terminal 2.
- Measure resistance between ground and ECM harness connector terminal 39.

Resistance should be approximately 1 ohm or less, is it?

Repair open in wire between ECT sensor harness connector terminal 1 and ECM harness connector terminal 35. Clear code and verify ECT sensor is within normal parameters.

Verify ECM connector is secure. If OK, replace ECT with known good component. Clear code and verify ECT sensor is within normal parameters. If problem persists, replace ECM.

Repair open in wire between ECT sensor harness connector terminal 3 for SOHC or 2 for DOHC and ECM harness connector terminal 39.
Clear code and verify ECT sensor is within normal parameters.



- Turn ignition switch on.
- Connect scan tool to data link connector.
- Verify DTC P0118 is set.

- Engine idling at normal operating temperature.
- Using scan tool, observe Engine Coolant Termperature (ECT) sensor reading.

Scanned temperature should be between 180°F and 203°F (82°C and 95°C), is it?

No, scanned temperature is above 203°F (95°C).

- Turn ignition off.
- Disconnect ECT sensor.
- Turn ignition on.
- Observe ECT sensor reading on scan tool.

Scanned temperature should now be -40°F (-40°C), is it?

Yes, scanned temperature is within normal parameters.

No problem found at this time. Fault is intermittent or was repaired and Engine Control Module (ECM) memory was not cleared.
Clear code and verify ECT sensor is within normal parameters.

Replace ECT sensor.

- ECT sensor disconnected.
- Turn ignition off.
- Disconnect ECM connector.
- For SOHC, measure resistance between ground and ECT sensor harness connector terminal 3.
- For DOHC, measure resistance between ground and ECT sensor harness connector terminal 2.

Resistance should indicate open circuit, does it?

Verify ECM connector is secure. If OK, replace ECT sensor with known good component. Clear code and verify ECT sensor is within normal parameters. If problem persists, replace ECM.

Repair short to ground in wire between ECT sensor harness connector terminal 2 for DOHC or terminal 3 for SOHC and ECM harness connector terminal 39. Clear code and verify ECT sensor is within normal parameters.

Fuel System > Troubleshooting > P0118

[P0116/P0117/P0118]

DTC	Diagnostic item
P0116 P0117 P0118	Engine Coolant Temperature Circuit Range/Performance Problem Engine Coolant Temperature Low Input Engine Coolant Temperature High Input

DESCRIPTION

The Engine Coolant Temperature (ECT) sensor is located in the coolant passage of the cylinder head. The ECT sensor is a variable resistor whose resistance changes as the temperature of the engine coolant flowing past the sensor changes.When coolant temperature is low, sensor resistance is high; when coolant temperature is high, sensor resistance is low.

The Engine Control Module (ECM) checks ECT sensor voltage and uses the information to adjust fuel injector pulse width and ignition timing. When the temperature sensed is very cold, the ECM enriches the fuel mixture and advances ignition timing. As coolant temperature rises, the ECM reduces the amount of enrichment and timing advance.

FAILURE CONDITIONS

The ECM will set P0116 and the Malfunction Indicator Lamp (MIL) will turn on if the ECT sensor's actual performance curve falls more than 68°F (20°C) below the ECM's modal curve (based on fuel delivery, ambient air temperature and engine running time) for 0.2 seconds during two driving cycles. This code indicates uncharacteristic engine temperature performance being read by the ECT sensor or ECM.

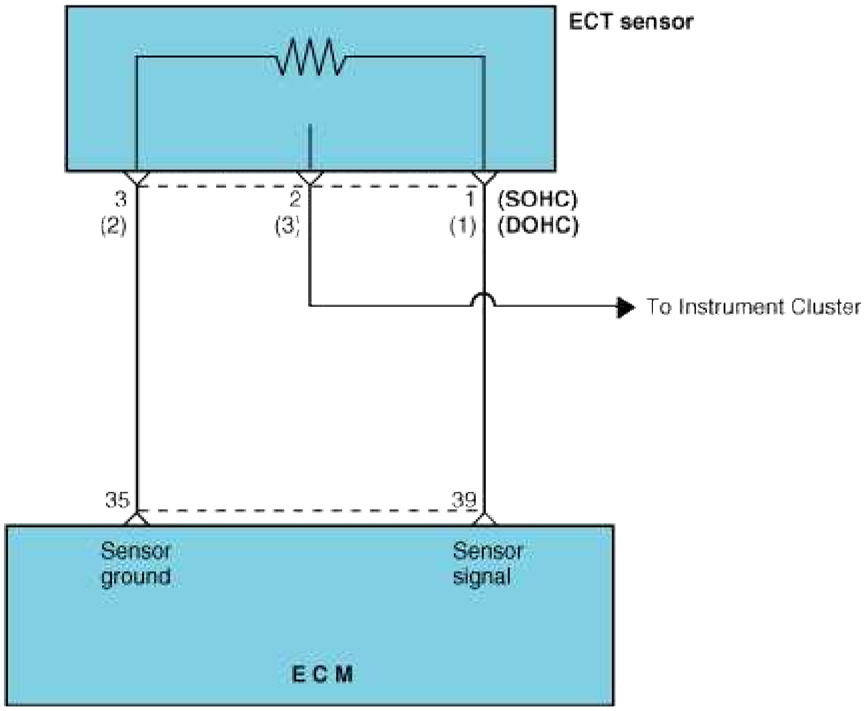
The ECM will set P0117 and the Malfunction Indicator Lamp (MIL) will turn on if the ECT sensor reports a temperature below -49°F (-45°C) for 0.2 seconds during two driving cycles. The ECM will set P0118 and the MalfunctionIndicator Lamp (MIL) will turn on if the ECT sensor reports a temperature above 284°F (140°C) for 0.2 seconds during two driving cycles.

NOTE

The ECT sensor resistance varies with temperature as follows :

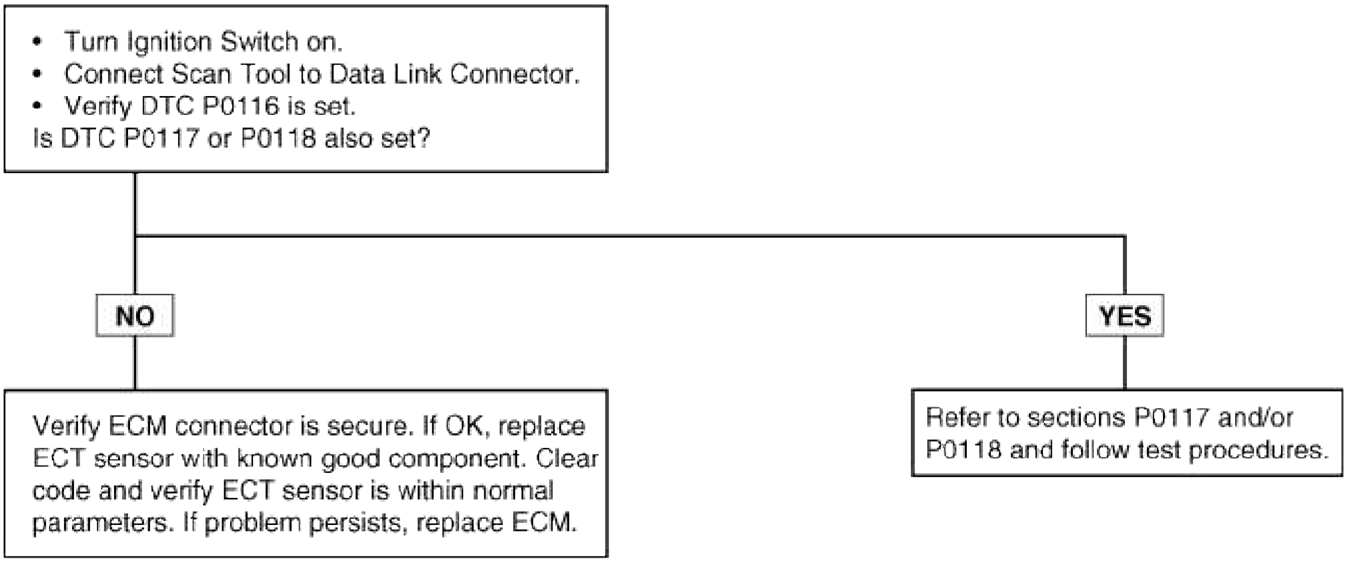
- 5900 ohms @ 32°F (0°C).
- 2500 ohms @ 68°F (20°C).
- 300 ohms @ 176°F (80°C).

CIRCUIT DIAGRAM


ECT sensor
3
(2)
2
(3)
1
(1)
(SOHC)
(DOHC)
To Instrument Cluster
35
39
Sensor ground
Sensor signal
E C M

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn Ignition Switch on.
- Connect Scan Tool to Data Link Connector.
- Verify DTC P0116 is set.

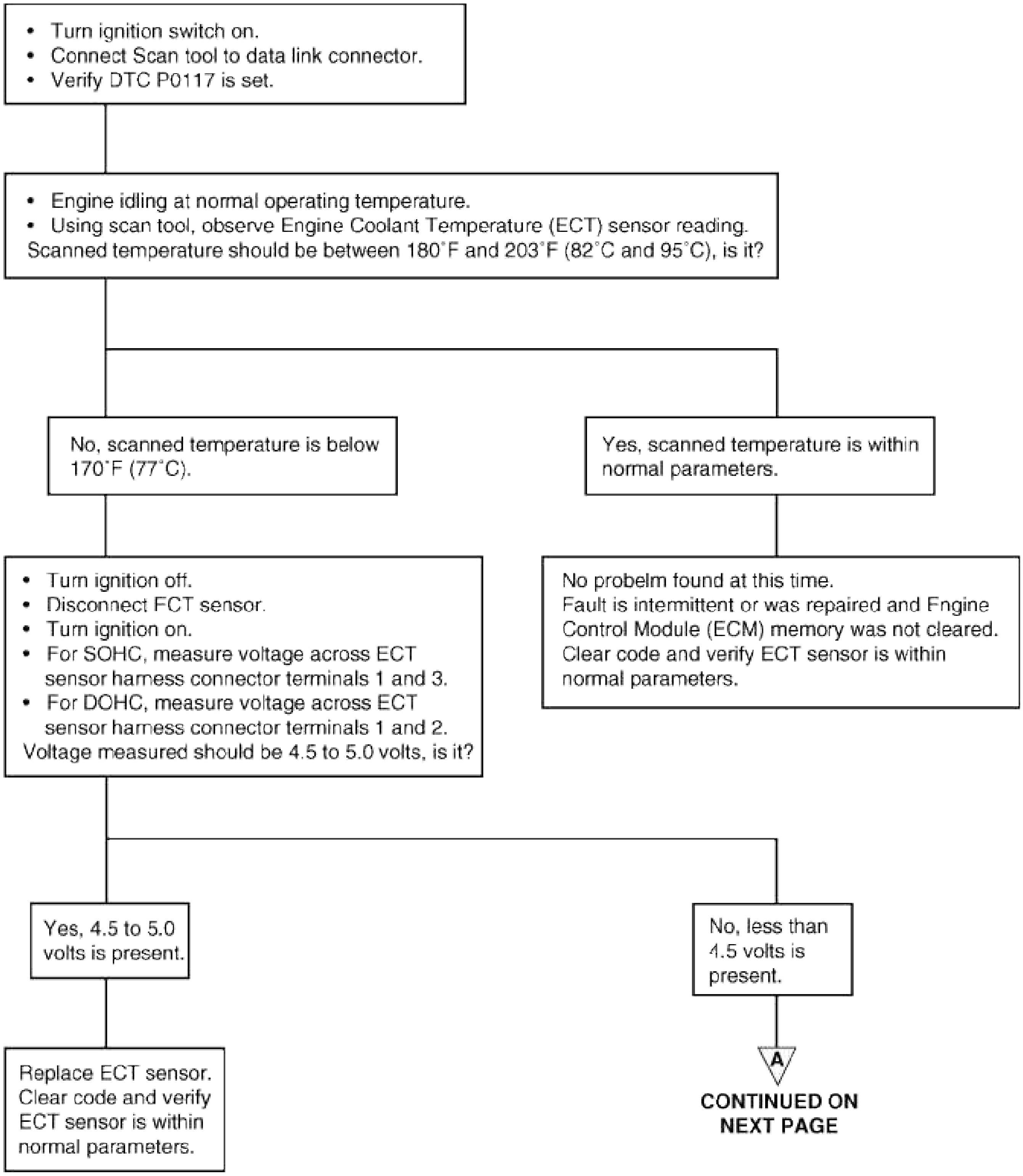
Is DTC P0117 or P0118 also set?

NO

Verify ECM connector is secure. If OK, replace ECT sensor with known good component. Clear code and verify ECT sensor is within normal parameters. If problem persists, replace ECM.

YES

Refer to sections P0117 and/or P0118 and follow test procedures.



- Turn ignition switch on.
- Connect Scan tool to data link connector.
- Verify DTC P0117 is set.

- Engine idling at normal operating temperature.
- Using scan tool, observe Engine Coolant Temperature (ECT) sensor reading.

Scanned temperature should be between 180°F and 203°F (82°C and 95°C), is it?

No, scanned temperature is below 170°F (77°C).

Yes, scanned temperature is within normal parameters.

- Turn ignition off.
- Disconnect FCT sensor.
- Turn ignition on.
- For SOHC, measure voltage across ECT sensor harness connector terminals 1 and 3.
- For DOHC, measure voltage across ECT sensor harness connector terminals 1 and 2.

Voltage measured should be 4.5 to 5.0 volts, is it?

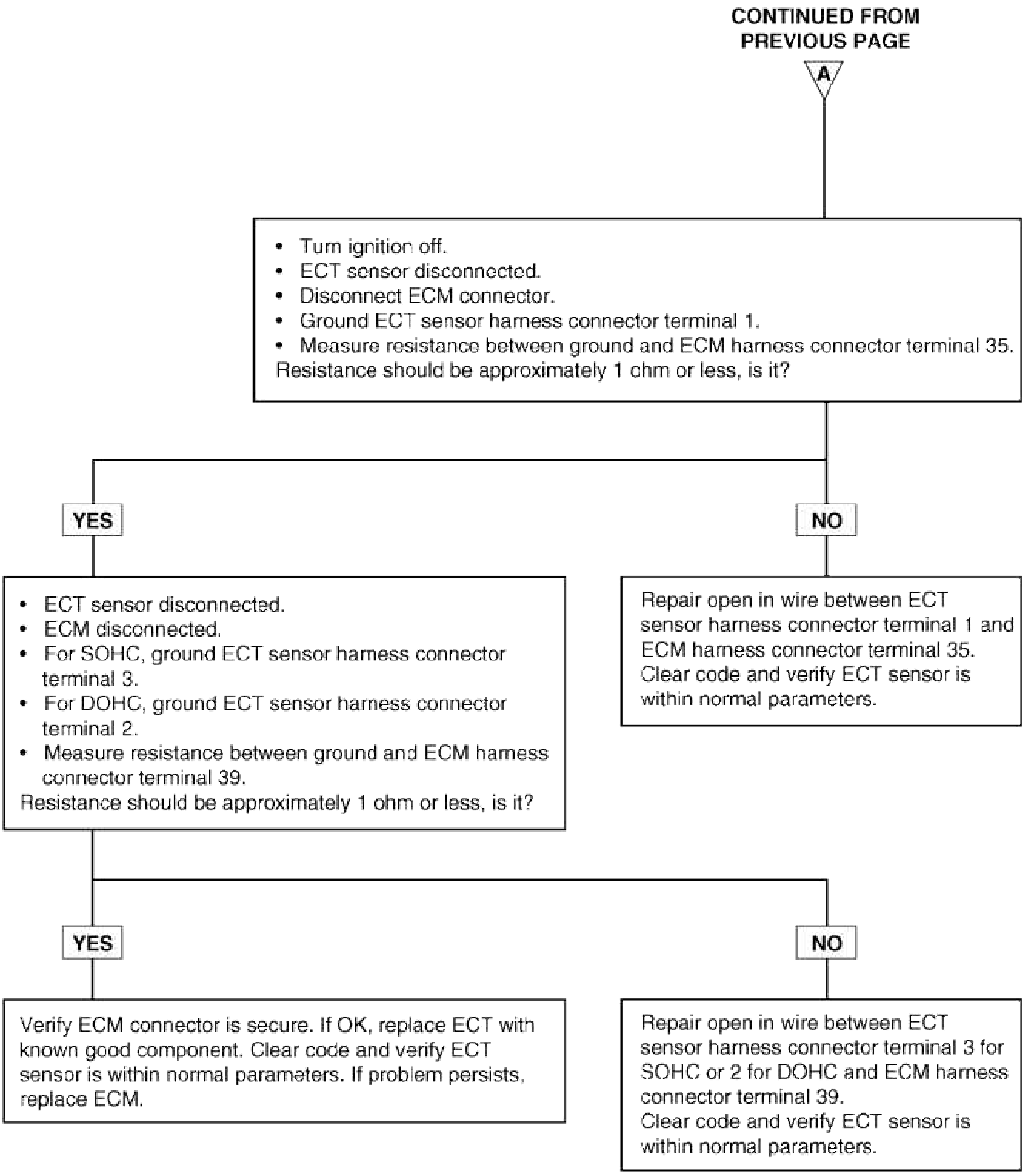
No probelm found at this time. Fault is intermittent or was repaired and Engine Control Module (ECM) memory was not cleared. Clear code and verify ECT sensor is within normal parameters.

Yes, 4.5 to 5.0 volts is present.

No, less than 4.5 volts is present.

Replace ECT sensor. Clear code and verify ECT sensor is within normal parameters.

CONTINUED ON NEXT PAGE



- Turn ignition off.
- ECT sensor disconnected.
- Disconnect ECM connector.
- Ground ECT sensor harness connector terminal 1.
- Measure resistance between ground and ECM harness connector terminal 35.

Resistance should be approximately 1 ohm or less, is it?

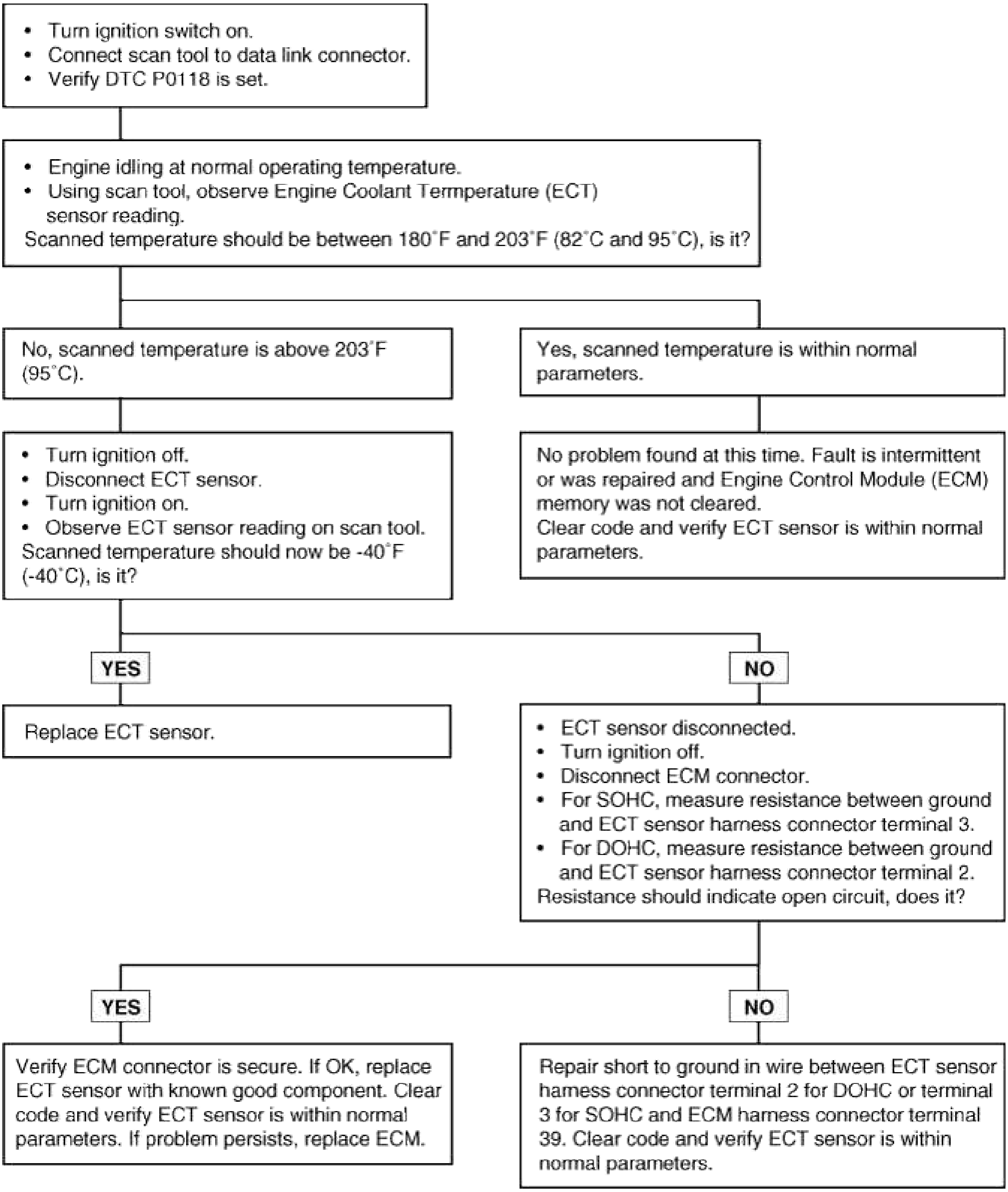
- ECT sensor disconnected.
- ECM disconnected.
- For SOHC, ground ECT sensor harness connector terminal 3.
- For DOHC, ground ECT sensor harness connector terminal 2.
- Measure resistance between ground and ECM harness connector terminal 39.

Resistance should be approximately 1 ohm or less, is it?

Repair open in wire between ECT sensor harness connector terminal 1 and ECM harness connector terminal 35. Clear code and verify ECT sensor is within normal parameters.

Verify ECM connector is secure. If OK, replace ECT with known good component. Clear code and verify ECT sensor is within normal parameters. If problem persists, replace ECM.

Repair open in wire between ECT sensor harness connector terminal 3 for SOHC or 2 for DOHC and ECM harness connector terminal 39.
Clear code and verify ECT sensor is within normal parameters.



- Turn ignition switch on.
- Connect scan tool to data link connector.
- Verify DTC P0118 is set.

- Engine idling at normal operating temperature.
- Using scan tool, observe Engine Coolant Termperature (ECT) sensor reading.

Scanned temperature should be between 180°F and 203°F (82°C and 95°C), is it?

No, scanned temperature is above 203°F (95°C).

Yes, scanned temperature is within normal parameters.

- Turn ignition off.
- Disconnect ECT sensor.
- Turn ignition on.
- Observe ECT sensor reading on scan tool.

Scanned temperature should now be -40°F (-40°C), is it?

No problem found at this time. Fault is intermittent or was repaired and Engine Control Module (ECM) memory was not cleared. Clear code and verify ECT sensor is within normal parameters.

YES

Replace ECT sensor.

NO

- ECT sensor disconnected.
- Turn ignition off.
- Disconnect ECM connector.
- For SOHC, measure resistance between ground and ECT sensor harness connector terminal 3.
- For DOHC, measure resistance between ground and ECT sensor harness connector terminal 2.

Resistance should indicate open circuit, does it?

YES

Verify ECM connector is secure. If OK, replace ECT sensor with known good component. Clear code and verify ECT sensor is within normal parameters. If problem persists, replace ECM.

NO

Repair short to ground in wire between ECT sensor harness connector terminal 2 for DOHC or terminal 3 for SOHC and ECM harness connector terminal 39. Clear code and verify ECT sensor is within normal parameters.

Fuel System > Troubleshooting > P0121

[P0121/P0122/P0123]

DTC	Diagnostic item
P0121 P0122 P0123	TPS Circuit Range/Performance Problem TPS Circuit Low Input TPS Circuit High Input

DESCRIPTION

The Throttle Position sensor mounts on the side of the throttle body and is connected to the throttle valve shaft. The TPS is a variable resistor (potentiometer) whose resistance changes according to throttle valve shaft position. During acceleration, the TPS resistance decreases; during deceleration, the TPS resistance increases.

The Engine Control Module (ECM) applies a reference voltage to the TPS and then measures the voltage that is present on the TPS signal circuit. The ECM uses the TPS signal to adjust timing and injector pulse width. The TPS signal along with the MAF sensor signal is used by the ECM to calculate engine load.

FAILURE CONDITIONS

The ECM will set P0121 and the Malfunction Indicator Lamp (MIL) will turn on if the engine load indicated by the Throttle Position (TP) sensor and the MAP sensor are different. This code indicates that the throttle position and air flow readings by the TPS and MAP sensor, or ECM, do not result in the expected engine load value.

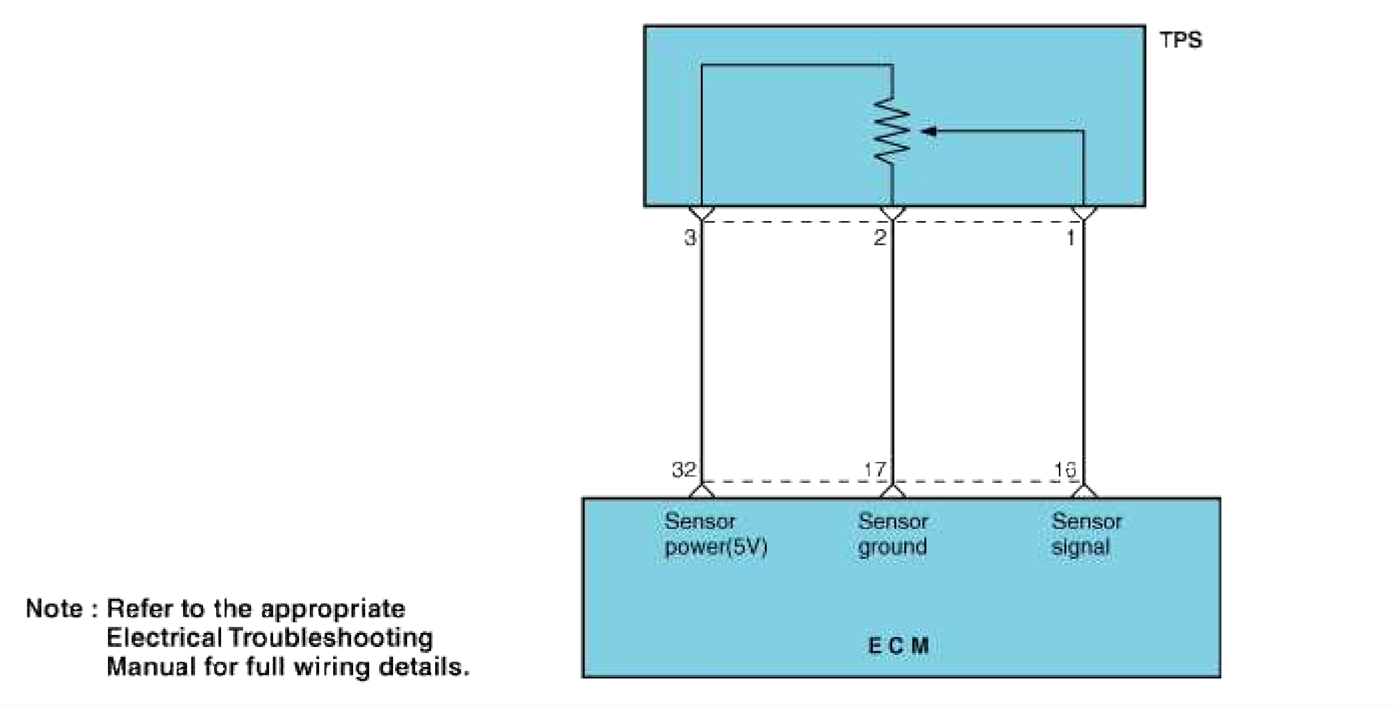
The ECM will set P0122 and the Malfunction Indicator Lamp (MIL) will turn on if the throttle angle is reported as less than 2.1 degrees for more than 0.2 seconds during 2-driving cycles. This code indicates an unusually low throttle position angle being read by the TP sensor or ECM.

The ECM will set P0123 and the Malfunction Indicator Lamp (MIL) will turn on if the throttle angle is reported as greater than 105.4 degrees for 0.2 seconds during 2-driving cycles. This code indicates an unusually high throttle position angle being read by the TP sensor or ECM.

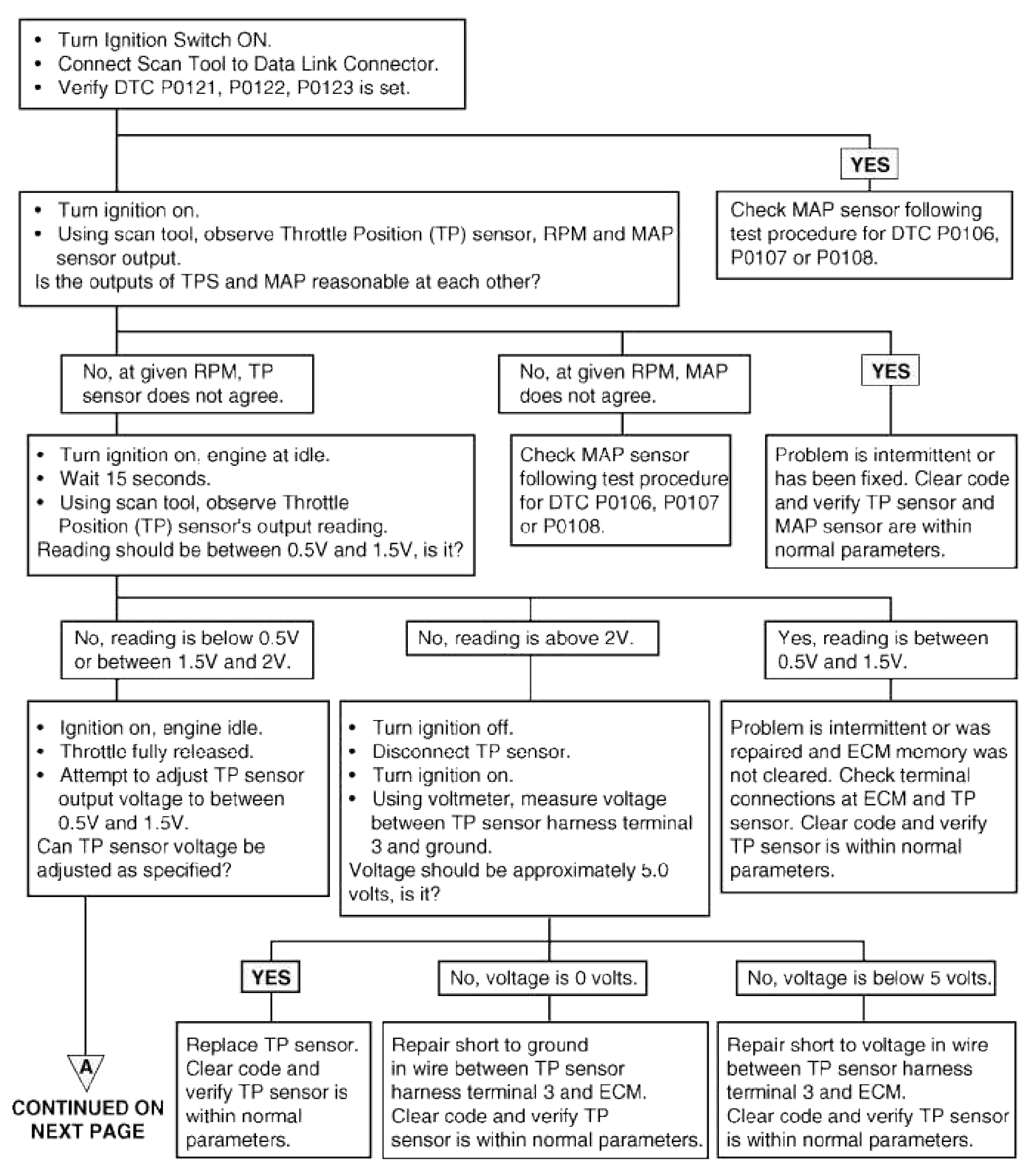
NOTE

The standard resistance value between terminals 1 and 3 of the throttle position sensor is 1600~2500 ohms.

CIRCUIT DIAGRAM


TPS
3
2
1
32
17
16
Sensor power(5V)
Sensor ground
Sensor signal
ECM
Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn Ignition Switch ON.
- Connect Scan Tool to Data Link Connector.
- Verify DTC P0121, P0122, P0123 is set.

Check MAP sensor following test procedure for DTC P0106, P0107 or P0108.

- Turn ignition on.
- Using scan tool, observe Throttle Position (TP) sensor, RPM and MAP sensor output.

Is the outputs of TPS and MAP reasonable at each other?

No, at given RPM, TP sensor does not agree.

No, at given RPM, MAP does not agree.

- Turn ignition on, engine at idle.
- Wait 15 seconds.
- Using scan tool, observe Throttle Position (TP) sensor's output reading.

Reading should be between 0.5V and 1.5V, is it?

Check MAP sensor following test procedure for DTC P0106, P0107 or P0108.

Problem is intermittent or has been fixed. Clear code and verify TP sensor and MAP sensor are within normal parameters.

No, reading is below 0.5V or between 1.5V and 2V.

No, reading is above 2V.

Yes, reading is between 0.5V and 1.5V.

- Ignition on, engine idle.
- Throttle fully released.
- Attempt to adjust TP sensor output voltage to between 0.5V and 1.5V.

Can TP sensor voltage be adjusted as specified?

- Turn ignition off.
- Disconnect TP sensor.
- Turn ignition on.
- Using voltmeter, measure voltage between TP sensor harness terminal 3 and ground.

Voltage should be approximately 5.0 volts, is it?

Problem is intermittent or was repaired and ECM memory was not cleared. Check terminal connections at ECM and TP sensor. Clear code and verify TP sensor is within normal parameters.

No, voltage is 0 volts.

No, voltage is below 5 volts.

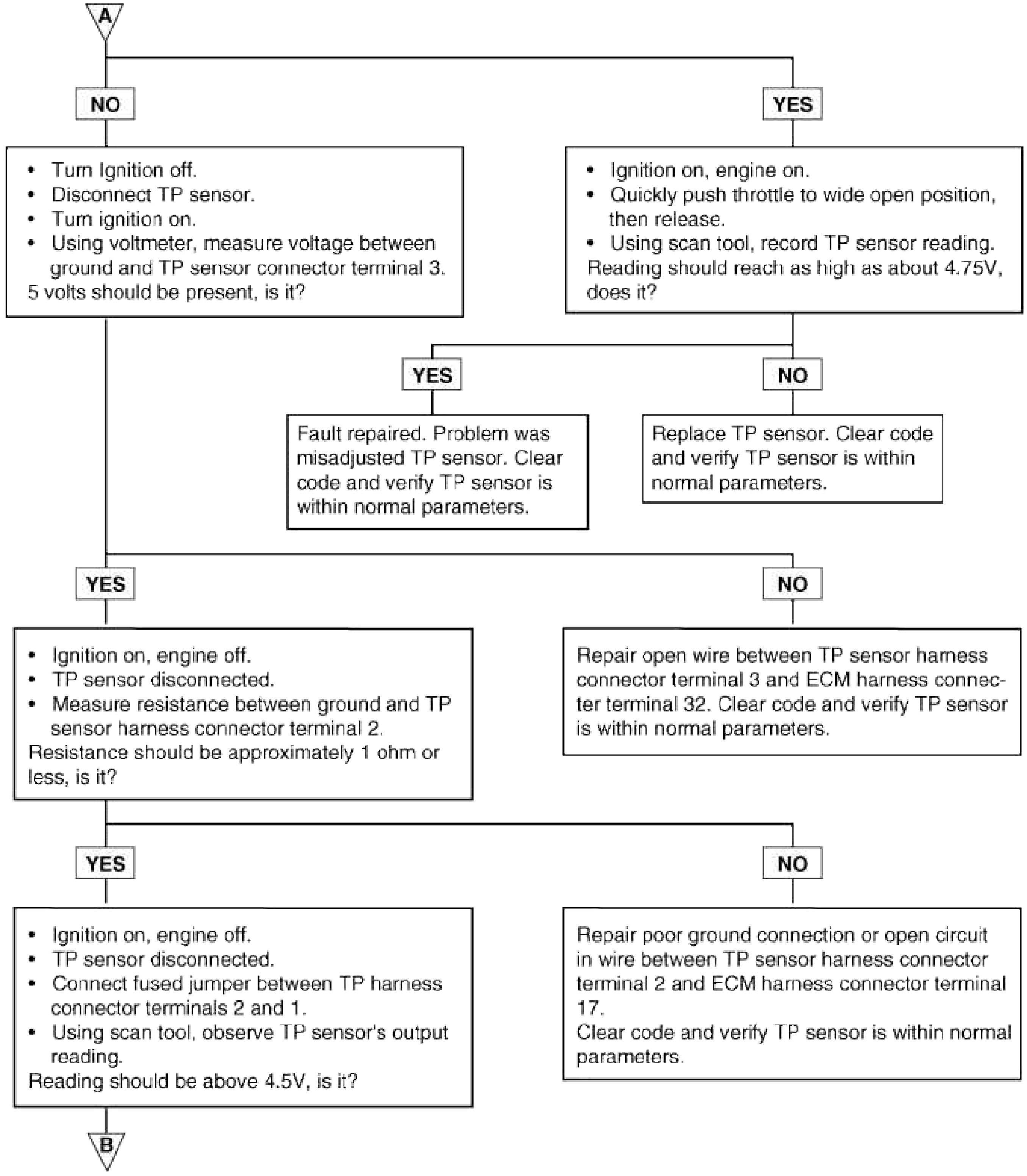
CONTINUED ON NEXT PAGE

Replace TP sensor. Clear code and verify TP sensor is within normal parameters.

Repair short to ground in wire between TP sensor harness terminal 3 and ECM. Clear code and verify TP sensor is within normal parameters.

Repair short to voltage in wire between TP sensor harness terminal 3 and ECM. Clear code and verify TP sensor is within normal parameters.

CONTINUED FROM PREVIOUS PAGE



- Turn Ignition off.
- Disconnect TP sensor.
- Turn ignition on.
- Using voltmeter, measure voltage between ground and TP sensor connector terminal 3.

5 volts should be present, is it?

- Ignition on, engine on.
- Quickly push throttle to wide open position, then release.
- Using scan tool, record TP sensor reading.

Reading should reach as high as about 4.75V, does it?

Fault repaired. Problem was misadjusted TP sensor. Clear code and verify TP sensor is within normal parameters.

Replace TP sensor. Clear code and verify TP sensor is within normal parameters.

- Ignition on, engine off.
- TP sensor disconnected.
- Measure resistance between ground and TP sensor harness connector terminal 2.

Resistance should be approximately 1 ohm or less, is it?

Repair open wire between TP sensor harness connector terminal 3 and ECM harness connecter terminal 32. Clear code and verify TP sensor is within normal parameters.

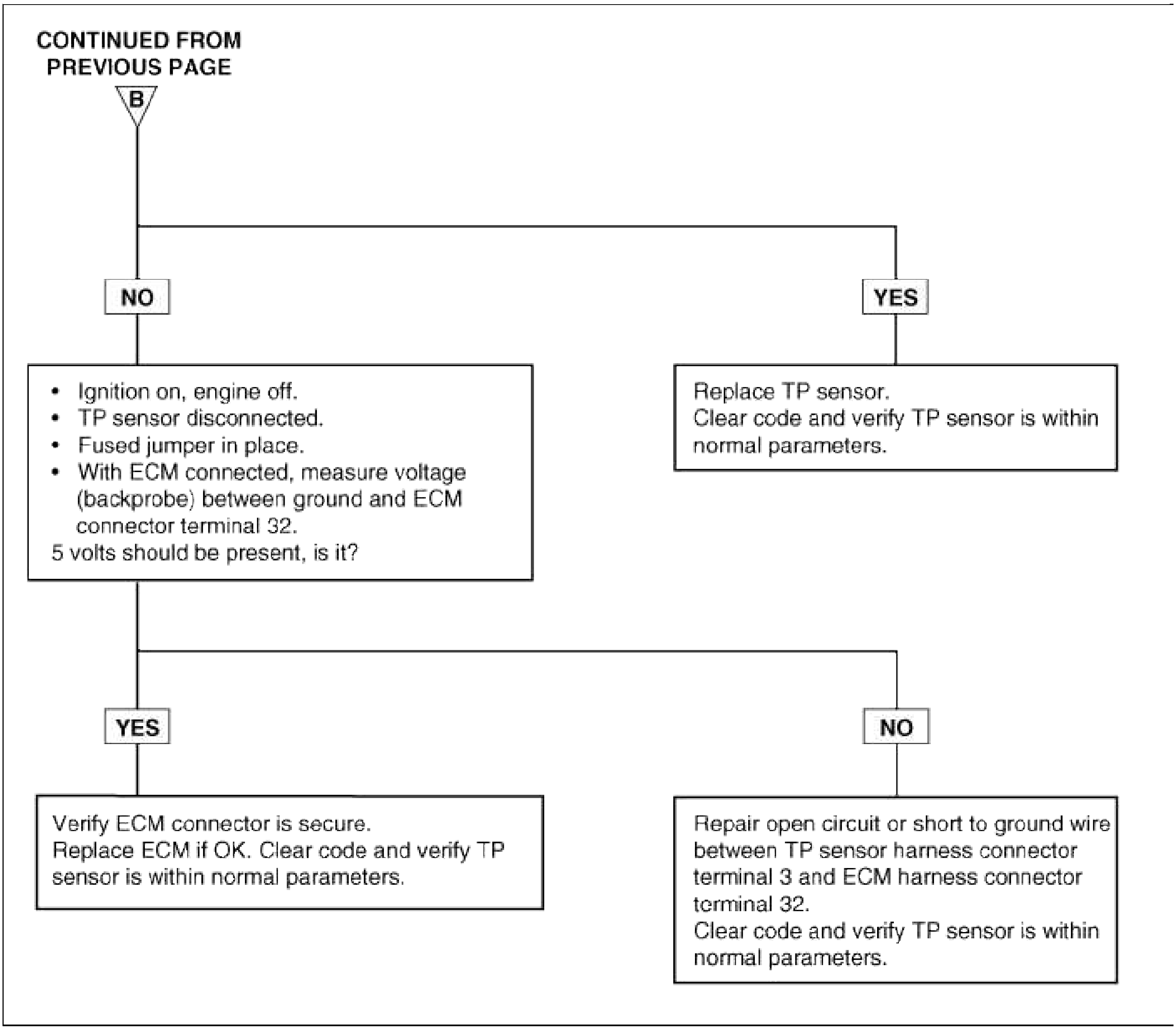
- Ignition on, engine off.
- TP sensor disconnected.
- Connect fused jumper between TP harness connector terminals 2 and 1.
- Using scan tool, observe TP sensor's output reading.

Reading should be above 4.5V, is it?

Repair poor ground connection or open circuit in wire between TP sensor harness connector terminal 2 and ECM harness connector terminal 17.

Clear code and verify TP sensor is within normal parameters.

CONTINUED ON NEXT PAGE



- Ignition on, engine off.
- TP sensor disconnected.
- Fused jumper in place.
- With ECM connected, measure voltage (backprobe) between ground and ECM connector terminal 32.

5 volts should be present, is it?

Replace TP sensor.
Clear code and verify TP sensor is within normal parameters.

Verify ECM connector is secure.
Replace ECM if OK. Clear code and verify TP sensor is within normal parameters.

Repair open circuit or short to ground wire between TP sensor harness connector terminal 3 and ECM harness connector terminal 32.
Clear code and verify TP sensor is within normal parameters.

Fuel System > Troubleshooting > P0122

[P0121/P0122/P0123]

DTC	Diagnostic item
P0121 P0122 P0123	TPS Circuit Range/Performance Problem TPS Circuit Low Input TPS Circuit High Input

DESCRIPTION

The Throttle Position sensor mounts on the side of the throttle body and is connected to the throttle valve shaft. The TPS is a variable resistor (potentiometer) whose resistance changes according to throttle valve shaft position. During acceleration, the TPS resistance decreases; during deceleration, the TPS resistance increases.

The Engine Control Module (ECM) applies a reference voltage to the TPS and then measures the voltage that is present on the TPS signal circuit. The ECM uses the TPS signal to adjust timing and injector pulse width. The TPS signal along with the MAF sensor signal is used by the ECM to calculate engine load.

FAILURE CONDITIONS

The ECM will set P0121 and the Malfunction Indicator Lamp (MIL) will turn on if the engine load indicated by the

Throttle Position (TP) sensor and the MAP sensor are different. This code indicates that the throttle position and air flow readings by the TPS and MAP sensor, or ECM, do not result in the expected engine load value.

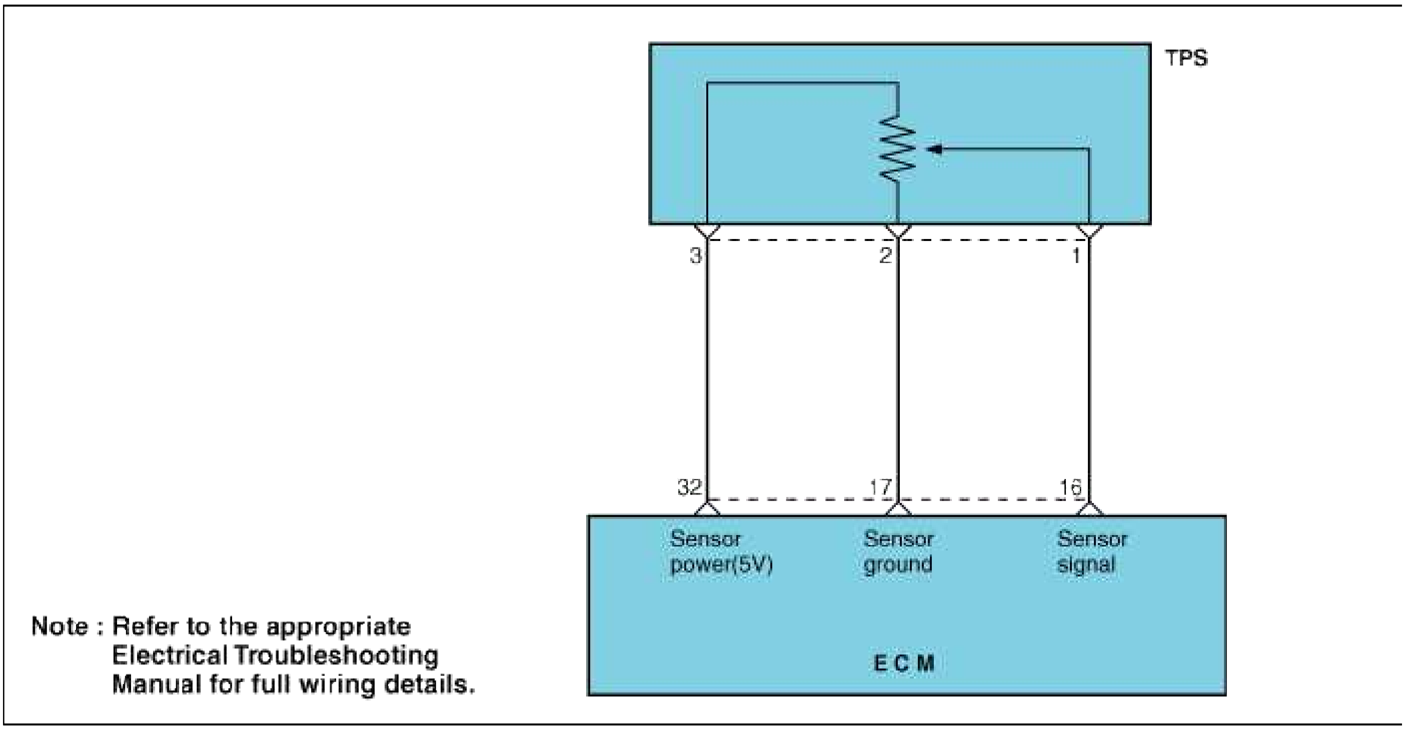
The ECM will set P0122 and the Malfunction Indicator Lamp (MIL) will turn on if the throttle angle is reported as less than 2.1 degrees for more than 0.2 seconds during 2-driving cycles. This code indicates an unusually low throttle position angle being read by the TP sensor or ECM.

The ECM will set P0123 and the Malfunction Indicator Lamp (MIL) will turn on if the throttle angle is reported as greater than 105.4 degrees for 0.2 seconds during 2-driving cycles. This code indicates an unusually high throttle position angle being read by the TP sensor or ECM.

NOTE

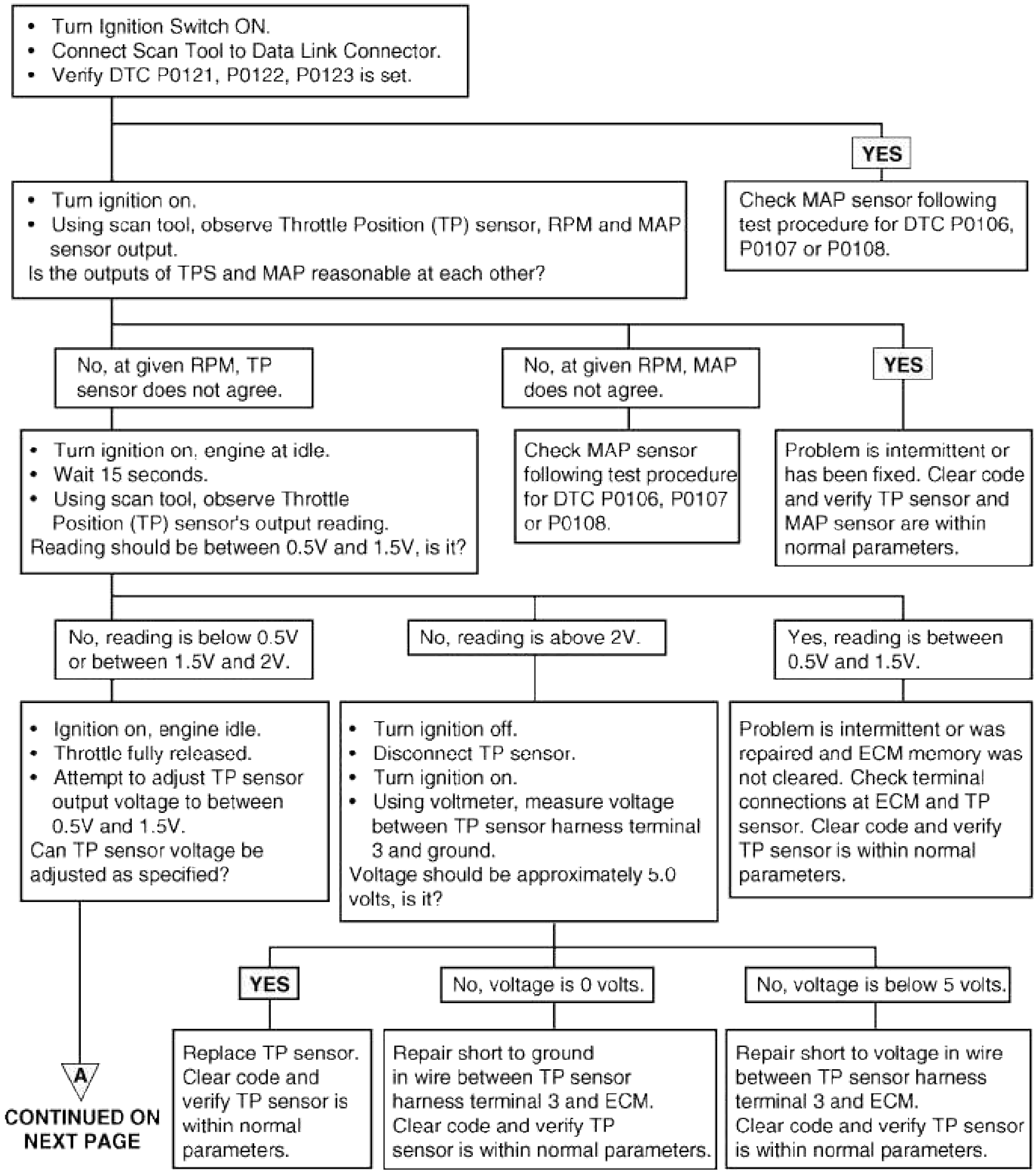
The standard resistance value between terminals 1 and 3 of the throttle position sensor is 1600~2500 ohms.

CIRCUIT DIAGRAM



Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn Ignition Switch ON.
- Connect Scan Tool to Data Link Connector.
- Verify DTC P0121, P0122, P0123 is set.

Check MAP sensor following test procedure for DTC P0106, P0107 or P0108.

- Turn ignition on.
- Using scan tool, observe Throttle Position (TP) sensor, RPM and MAP sensor output.

Is the outputs of TPS and MAP reasonable at each other?

No, at given RPM, TP sensor does not agree.

- Turn ignition on, engine at idle.
- Wait 15 seconds.
- Using scan tool, observe Throttle Position (TP) sensor's output reading.

Reading should be between 0.5V and 1.5V, is it?

No, at given RPM, MAP does not agree.

Check MAP sensor following test procedure for DTC P0106, P0107 or P0108.

Problem is intermittent or has been fixed. Clear code and verify TP sensor and MAP sensor are within normal parameters.

No, reading is below 0.5V or between 1.5V and 2V.

- Ignition on, engine idle.
- Throttle fully released.
- Attempt to adjust TP sensor output voltage to between 0.5V and 1.5V.

Can TP sensor voltage be adjusted as specified?

No, reading is above 2V.

- Turn ignition off.
- Disconnect TP sensor.
- Turn ignition on.
- Using voltmeter, measure voltage between TP sensor harness terminal 3 and ground.

Voltage should be approximately 5.0 volts, is it?

Yes, reading is between 0.5V and 1.5V.

Problem is intermittent or was repaired and ECM memory was not cleared. Check terminal connections at ECM and TP sensor. Clear code and verify TP sensor is within normal parameters.

Replace TP sensor. Clear code and verify TP sensor is within normal parameters.

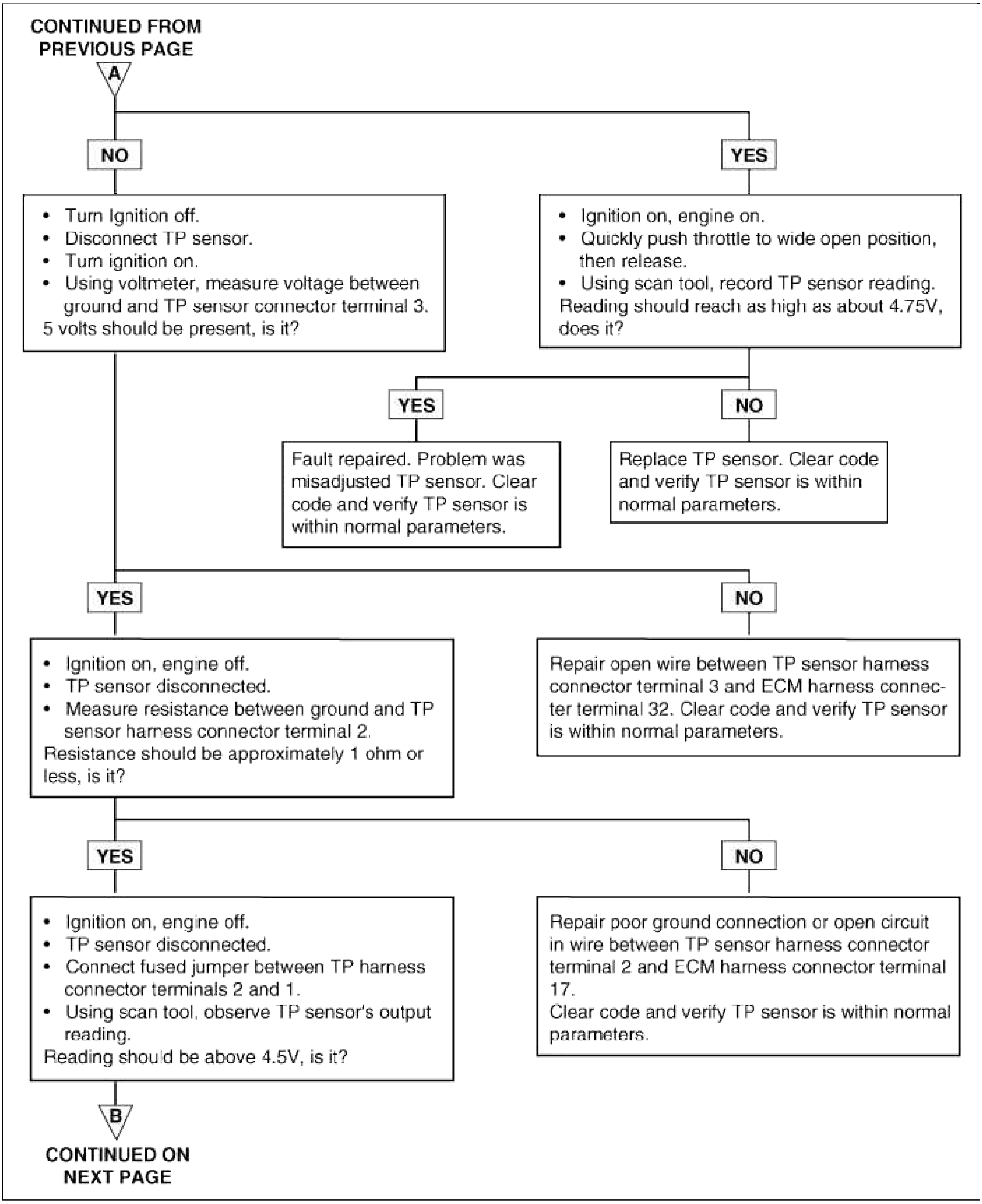
No, voltage is 0 volts.

Repair short to ground in wire between TP sensor harness terminal 3 and ECM. Clear code and verify TP sensor is within normal parameters.

No, voltage is below 5 volts.

Repair short to voltage in wire between TP sensor harness terminal 3 and ECM. Clear code and verify TP sensor is within normal parameters.

CONTINUED ON NEXT PAGE



CONTINUED FROM PREVIOUS PAGE

- Turn Ignition off.
- Disconnect TP sensor.
- Turn ignition on.
- Using voltmeter, measure voltage between ground and TP sensor connector terminal 3.

5 volts should be present, is it?

- Ignition on, engine on.
- Quickly push throttle to wide open position, then release.
- Using scan tool, record TP sensor reading.

Reading should reach as high as about 4.75V, does it?

Fault repaired. Problem was misadjusted TP sensor. Clear code and verify TP sensor is within normal parameters.

Replace TP sensor. Clear code and verify TP sensor is within normal parameters.

- Ignition on, engine off.
- TP sensor disconnected.
- Measure resistance between ground and TP sensor harness connector terminal 2.

Resistance should be approximately 1 ohm or less, is it?

Repair open wire between TP sensor harness connector terminal 3 and ECM harness connecter terminal 32. Clear code and verify TP sensor is within normal parameters.

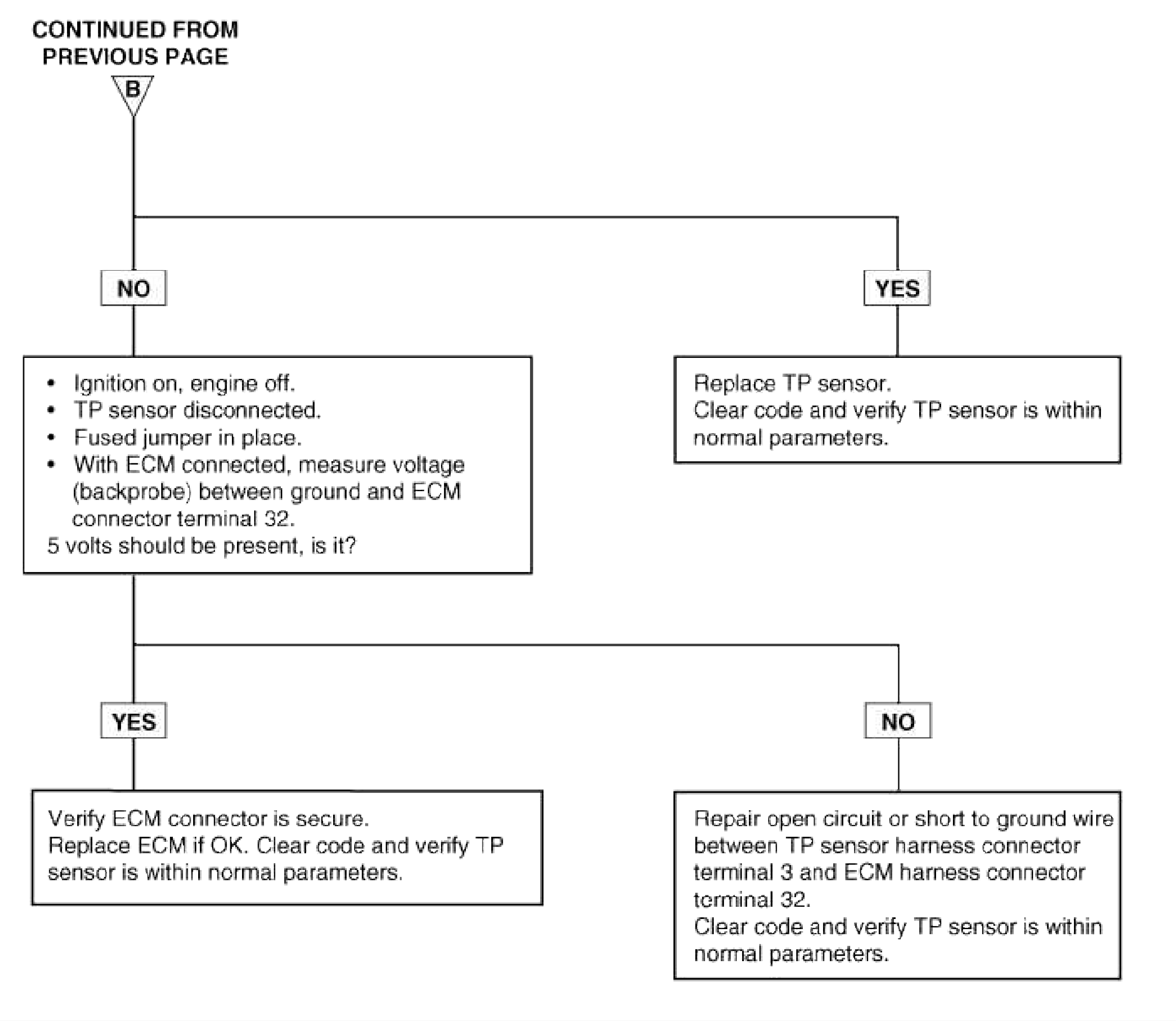
- Ignition on, engine off.
- TP sensor disconnected.
- Connect fused jumper between TP harness connector terminals 2 and 1.
- Using scan tool, observe TP sensor's output reading.

Reading should be above 4.5V, is it?

Repair poor ground connection or open circuit in wire between TP sensor harness connector terminal 2 and ECM harness connector terminal 17.

Clear code and verify TP sensor is within normal parameters.

CONTINUED ON NEXT PAGE



- Ignition on, engine off.
- TP sensor disconnected.
- Fused jumper in place.
- With ECM connected, measure voltage (backprobe) between ground and ECM connector terminal 32.

5 volts should be present, is it?

Replace TP sensor.
Clear code and verify TP sensor is within normal parameters.

Verify ECM connector is secure.
Replace ECM if OK. Clear code and verify TP sensor is within normal parameters.

Repair open circuit or short to ground wire between TP sensor harness connector terminal 3 and ECM harness connector terminal 32.
Clear code and verify TP sensor is within normal parameters.

Fuel System > Troubleshooting > P0123

[P0121/P0122/P0123]

DTC	Diagnostic item
P0121 P0122 P0123	TPS Circuit Range/Performance Problem TPS Circuit Low Input TPS Circuit High Input

DESCRIPTION

The Throttle Position sensor mounts on the side of the throttle body and is connected to the throttle valve shaft. The TPS is a variable resistor (potentiometer) whose resistance changes according to throttle valve shaft position. During acceleration, the TPS resistance decreases; during deceleration, the TPS resistance increases.

The Engine Control Module (ECM) applies a reference voltage to the TPS and then measures the voltage that is present on the TPS signal circuit. The ECM uses the TPS signal to adjust timing and injector pulse width. The TPS signal along with the MAF sensor signal is used by the ECM to calculate engine load.

FAILURE CONDITIONS

The ECM will set P0121 and the Malfunction Indicator Lamp (MIL) will turn on if the engine load indicated by the

Throttle Position (TP) sensor and the MAP sensor are different. This code indicates that the throttle position and air flow readings by the TPS and MAP sensor, or ECM, do not result in the expected engine load value.

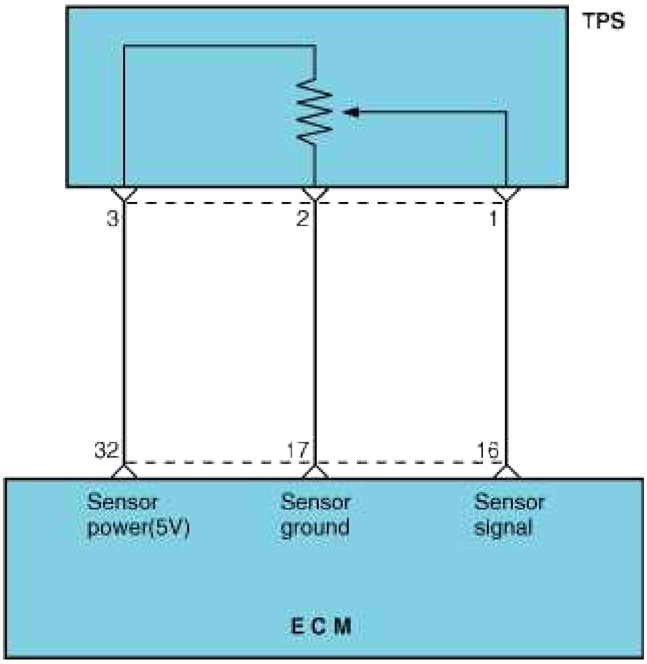
The ECM will set P0122 and the Malfunction Indicator Lamp (MIL) will turn on if the throttle angle is reported as less than 2.1 degrees for more than 0.2 seconds during 2-driving cycles. This code indicates an unusually low throttle position angle being read by the TP sensor or ECM.

The ECM will set P0123 and the Malfunction Indicator Lamp (MIL) will turn on if the throttle angle is reported as greater than 105.4 degrees for 0.2 seconds during 2-driving cycles. This code indicates an unusually high throttle position angle being read by the TP sensor or ECM.

NOTE

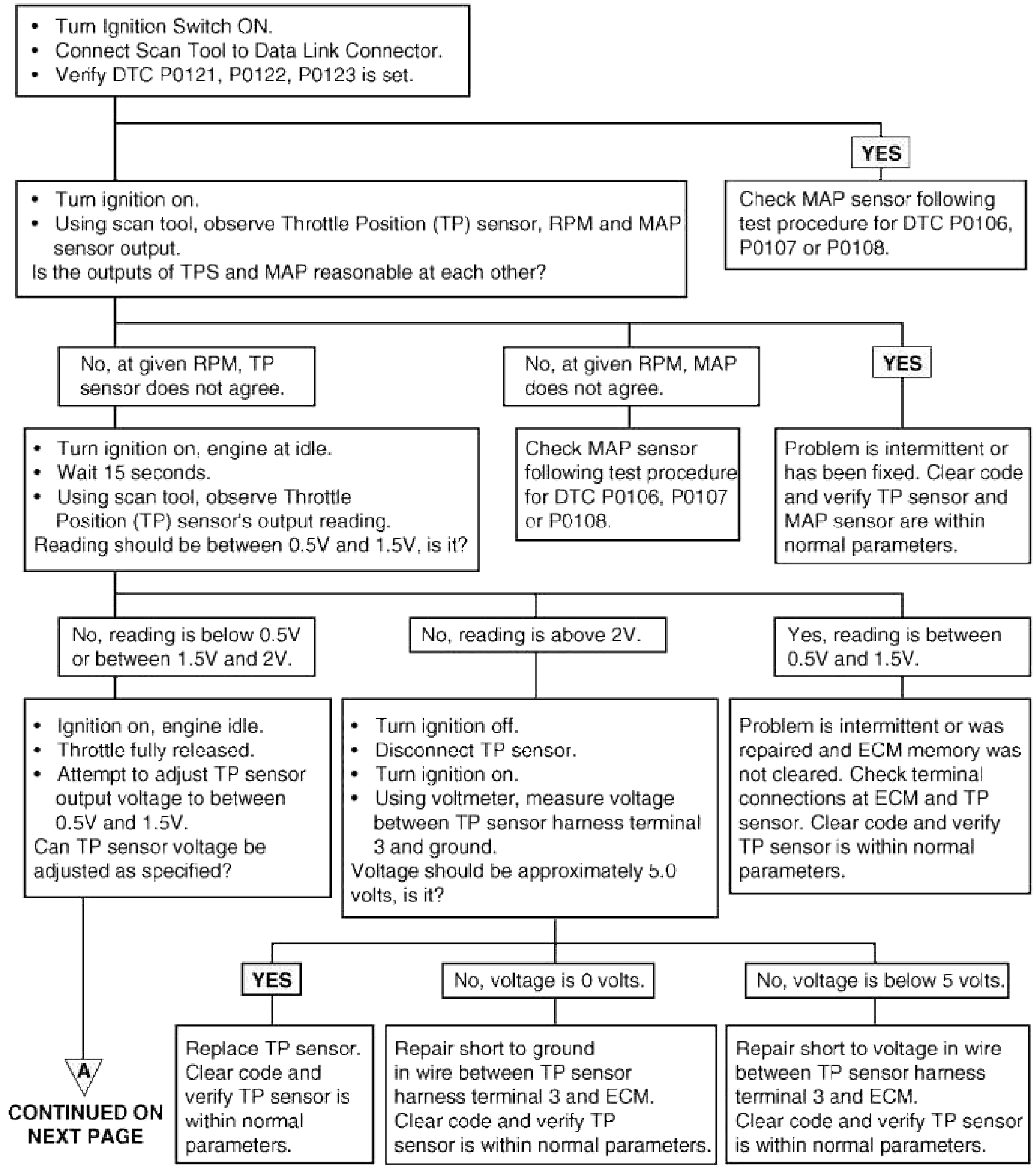
The standard resistance value between terminals 1 and 3 of the throttle position sensor is 1600~2500 ohms.

CIRCUIT DIAGRAM



Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn Ignition Switch ON.
- Connect Scan Tool to Data Link Connector.
- Verify DTC P0121, P0122, P0123 is set.

Check MAP sensor following test procedure for DTC P0106, P0107 or P0108.

- Turn ignition on.
- Using scan tool, observe Throttle Position (TP) sensor, RPM and MAP sensor output.

Is the outputs of TPS and MAP reasonable at each other?

No, at given RPM, TP sensor does not agree.

No, at given RPM, MAP does not agree.

- Turn ignition on, engine at idle.
- Wait 15 seconds.
- Using scan tool, observe Throttle Position (TP) sensor's output reading.

Reading should be between 0.5V and 1.5V, is it?

Check MAP sensor following test procedure for DTC P0106, P0107 or P0108.

Problem is intermittent or has been fixed. Clear code and verify TP sensor and MAP sensor are within normal parameters.

No, reading is below 0.5V or between 1.5V and 2V.

No, reading is above 2V.

Yes, reading is between 0.5V and 1.5V.

- Ignition on, engine idle.
- Throttle fully released.
- Attempt to adjust TP sensor output voltage to between 0.5V and 1.5V.

Can TP sensor voltage be adjusted as specified?

- Turn ignition off.
- Disconnect TP sensor.
- Turn ignition on.
- Using voltmeter, measure voltage between TP sensor harness terminal 3 and ground.

Voltage should be approximately 5.0 volts, is it?

Problem is intermittent or was repaired and ECM memory was not cleared. Check terminal connections at ECM and TP sensor. Clear code and verify TP sensor is within normal parameters.

No, voltage is 0 volts.

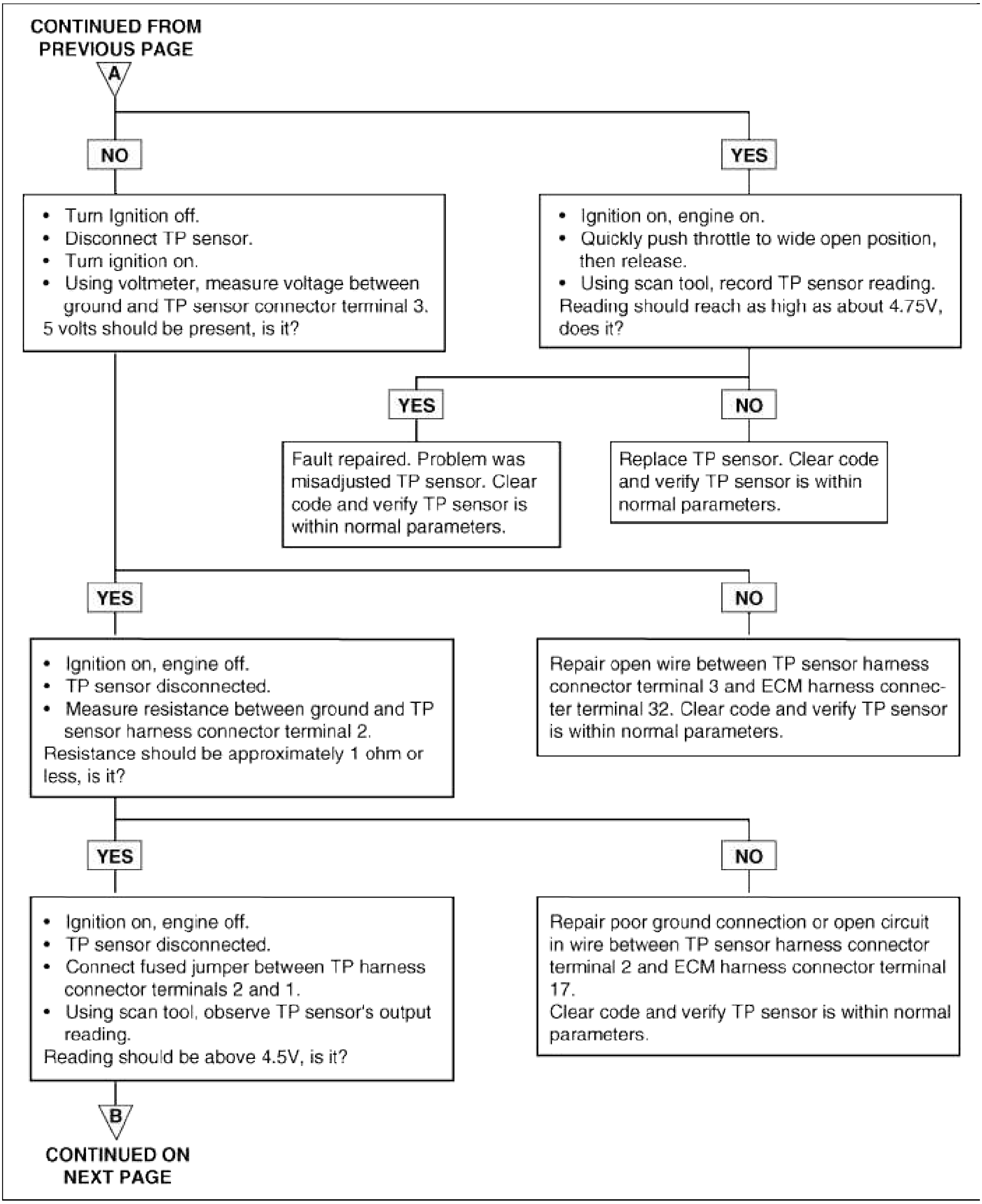
No, voltage is below 5 volts.

CONTINUED ON NEXT PAGE

Replace TP sensor. Clear code and verify TP sensor is within normal parameters.

Repair short to ground in wire between TP sensor harness terminal 3 and ECM. Clear code and verify TP sensor is within normal parameters.

Repair short to voltage in wire between TP sensor harness terminal 3 and ECM. Clear code and verify TP sensor is within normal parameters.



CONTINUED FROM PREVIOUS PAGE

NO:

- Turn Ignition off.
- Disconnect TP sensor.
- Turn ignition on.
- Using voltmeter, measure voltage between ground and TP sensor connector terminal 3.

5 volts should be present, is it?

YES:

- Ignition on, engine on.
- Quickly push throttle to wide open position, then release.
- Using scan tool, record TP sensor reading.

Reading should reach as high as about 4.75V, does it?

YES: Fault repaired. Problem was misadjusted TP sensor. Clear code and verify TP sensor is within normal parameters.

NO: Replace TP sensor. Clear code and verify TP sensor is within normal parameters.

YES:

- Ignition on, engine off.
- TP sensor disconnected.
- Measure resistance between ground and TP sensor harness connector terminal 2.

Resistance should be approximately 1 ohm or less, is it?

NO: Repair open wire between TP sensor harness connector terminal 3 and ECM harness connecter terminal 32. Clear code and verify TP sensor is within normal parameters.

YES:

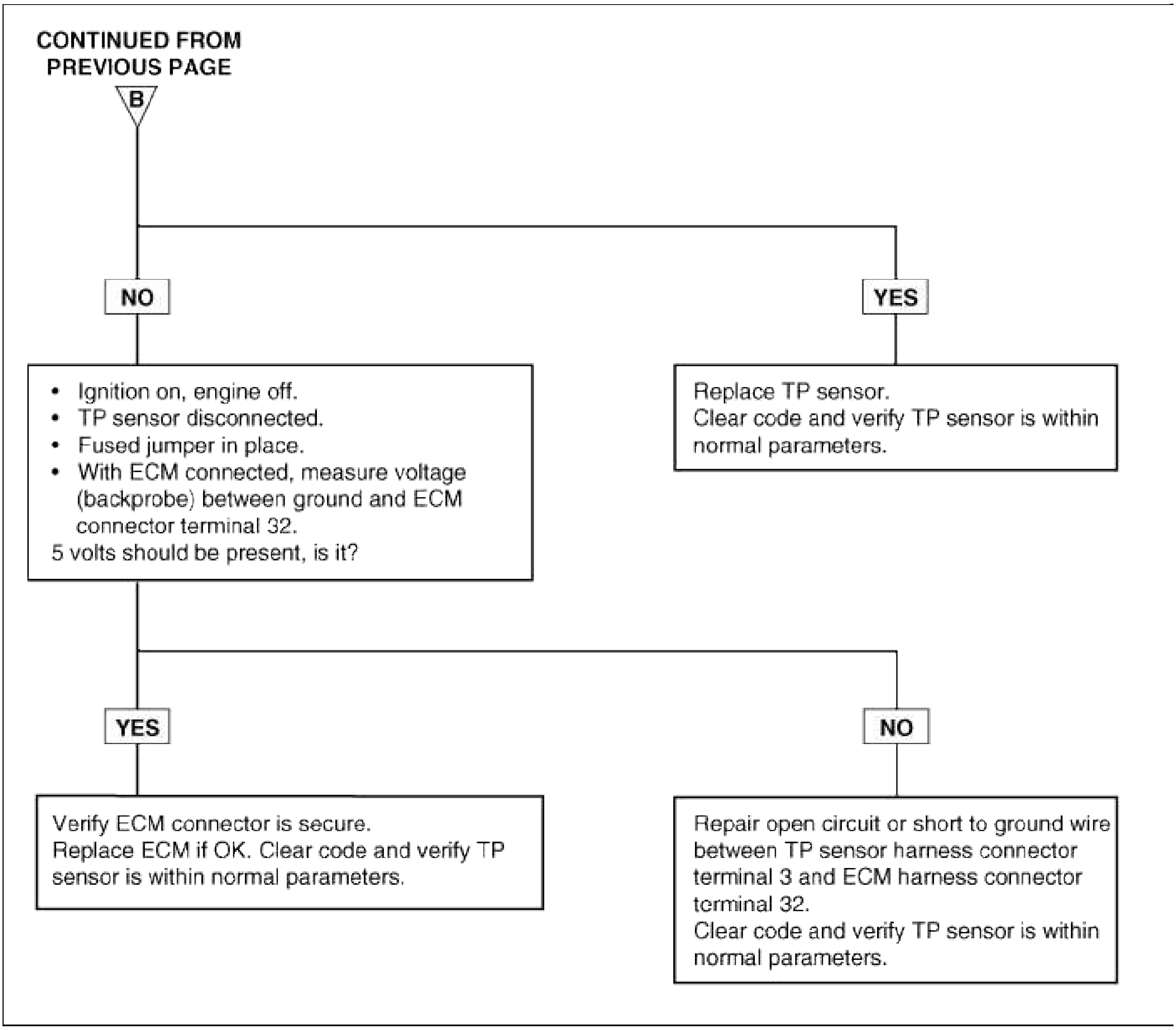
- Ignition on, engine off.
- TP sensor disconnected.
- Connect fused jumper between TP harness connector terminals 2 and 1.
- Using scan tool, observe TP sensor's output reading.

Reading should be above 4.5V, is it?

NO: Repair poor ground connection or open circuit in wire between TP sensor harness connector terminal 2 and ECM harness connector terminal 17.

Clear code and verify TP sensor is within normal parameters.

CONTINUED ON NEXT PAGE



- Ignition on, engine off.
- TP sensor disconnected.
- Fused jumper in place.
- With ECM connected, measure voltage (backprobe) between ground and ECM connector terminal 32.

5 volts should be present, is it?

Replace TP sensor.
Clear code and verify TP sensor is within normal parameters.

Verify ECM connector is secure.
Replace ECM if OK. Clear code and verify TP sensor is within normal parameters.

Repair open circuit or short to ground wire between TP sensor harness connector terminal 3 and ECM harness connector terminal 32.
Clear code and verify TP sensor is within normal parameters.

Fuel System > Troubleshooting > P0130

[P0130/P0136/P0140]

DTC	Diagnostic item
P0130 P0136 P0140	Oxygen Sensor Circuit Malfunction (Bank 1, Sensor 1) Oxygen Sensor Circuit Malfunction (Bank 1, Sensor 2) Oxygen Sensor Circuit No Activity (Bank 1, Sensor 2)

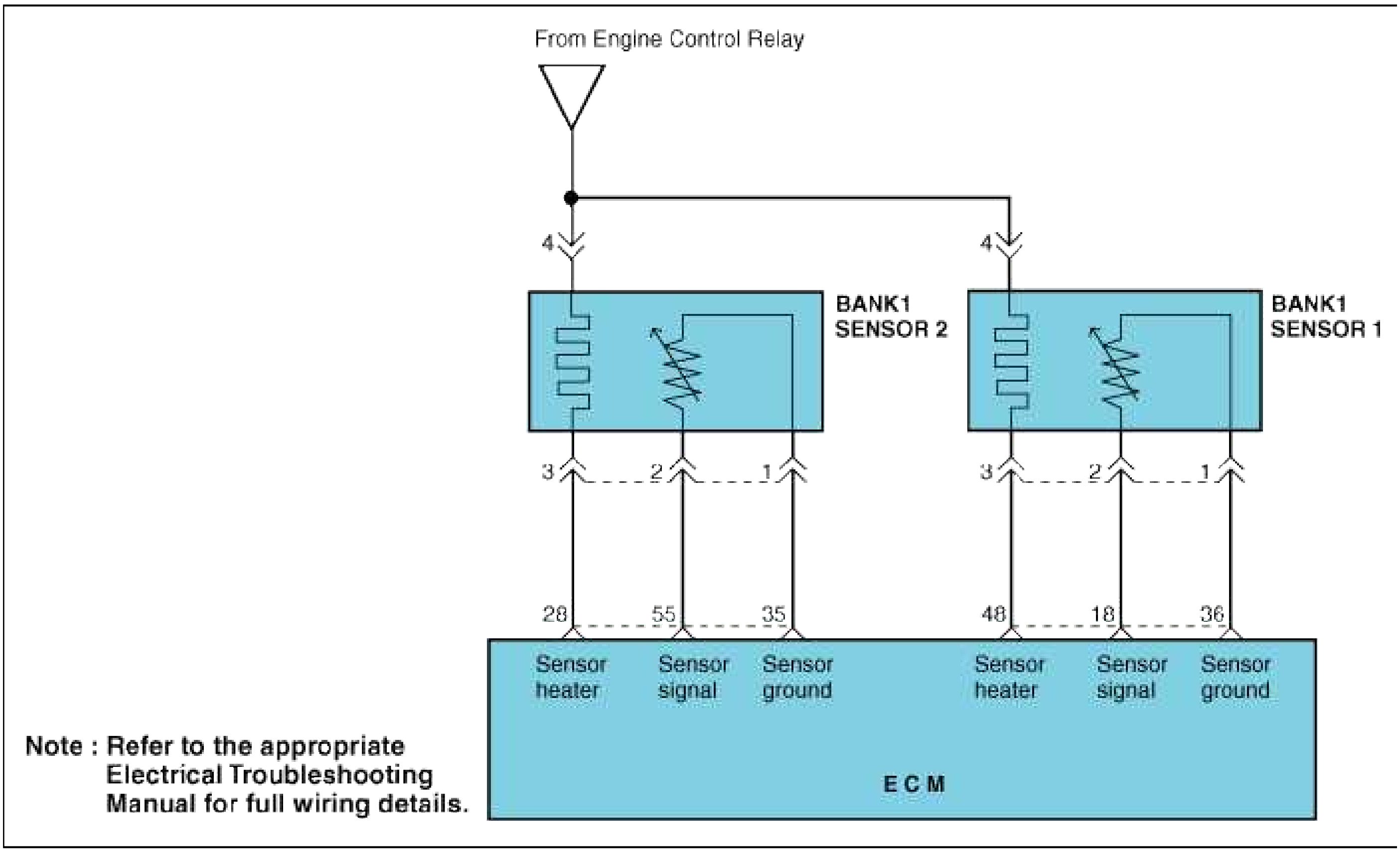
DESCRIPTION

The Engine Control Module (ECM) uses oxygen sensor signals to maintain the air fuel mixture at the ratio resulting in optimum fuel economy and reduced emissions. The amount of oxygen in the exhaust gases indicates, to the front oxygen sensor, whether the air fuel mixture being supplied to the engine cylinders is rich or lean. The readings of the rear oxygen sensor are used to indicate the efficiency of the catalytic converter. The ECM calculates catalytic converter efficiency by comparing the rear oxygen sensor signal to the front oxygen sensor signal.

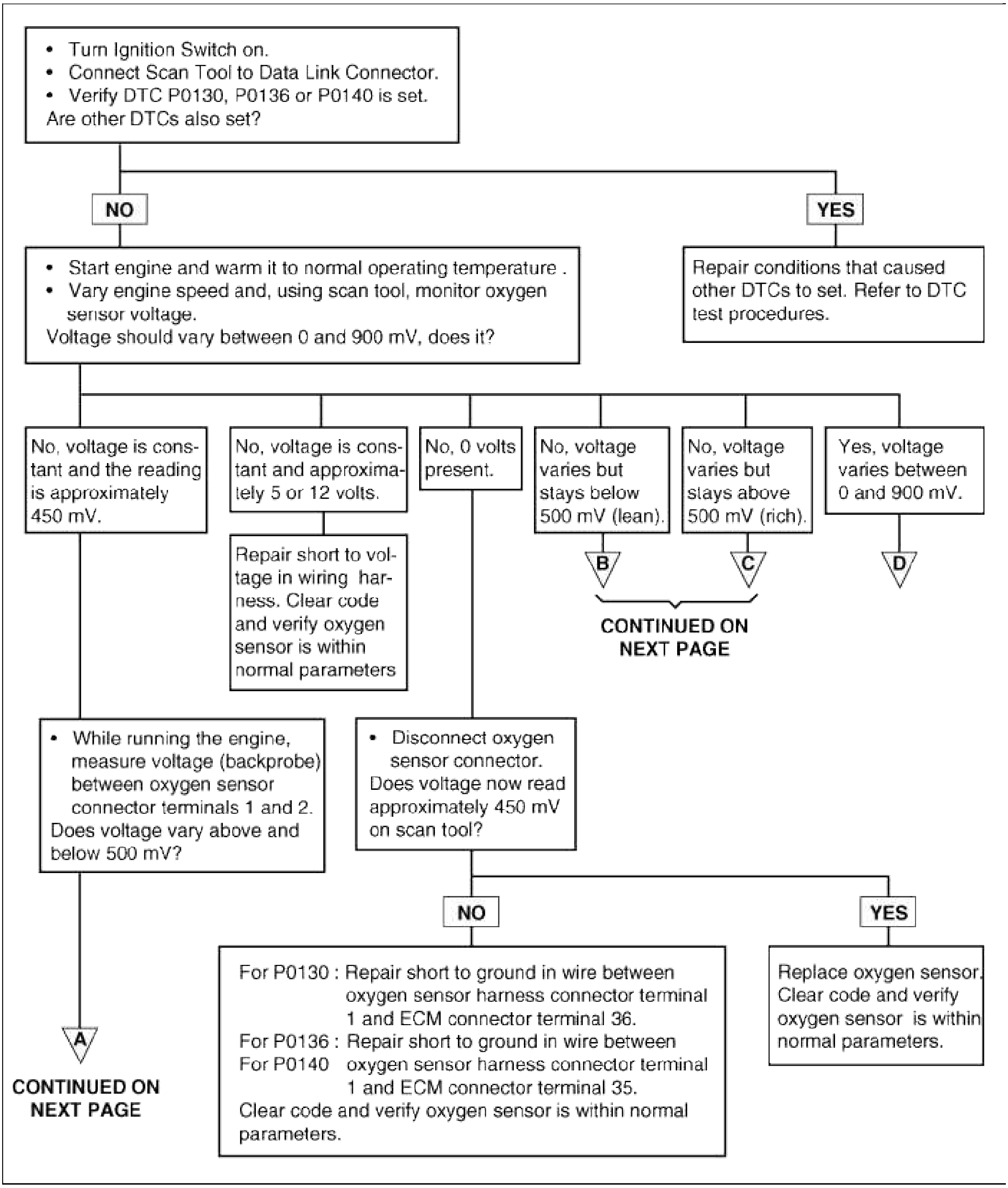
A normal oxygen sensor signal will constantly fluctuate above and below 500 mV, with the front oxygen sensor signal frequency of at least 5Hz at 2500 RPM. Due to the effect of the catalytic converter, the rear oxygen sensor signal frequency will be lower than the front oxygen sensor signal frequency. If the rear oxygen sensor signal coincides with the front oxygen sensor signal a large percentage of the time, this indicates a loss in efficiency of the catalytic converter or a malfunction within the fuel system.

FAILURE CONDITIONS

CIRCUIT DIAGRAM


From Engine Control Relay
4
4
BANK1 SENSOR 2
BANK1 SENSOR 1
3
2
1
3
2
1
28
55
35
48
18
36
Sensor heater
Sensor signal
Sensor ground
Sensor heater
Sensor signal
Sensor ground
E C M
Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn Ignition Switch on.
- Connect Scan Tool to Data Link Connector.
- Verify DTC P0130, P0136 or P0140 is set.

Are other DTCs also set?

- Start engine and warm it to normal operating temperature .
- Vary engine speed and, using scan tool, monitor oxygen sensor voltage.

Voltage should vary between 0 and 900 mV, does it?

Repair conditions that caused other DTCs to set. Refer to DTC test procedures.

No, voltage is constant and the reading is approximately 450 mV.

No, voltage is constant and approximately 5 or 12 volts.

No, 0 volts present.

No, voltage varies but stays below 500 mV (lean).

No, voltage varies but stays above 500 mV (rich).

Yes, voltage varies between 0 and 900 mV.

Repair short to voltage in wiring harness. Clear code and verify oxygen sensor is within normal parameters

CONTINUED ON NEXT PAGE

- While running the engine, measure voltage (backprobe) between oxygen sensor connector terminals 1 and 2.

Does voltage vary above and below 500 mV?

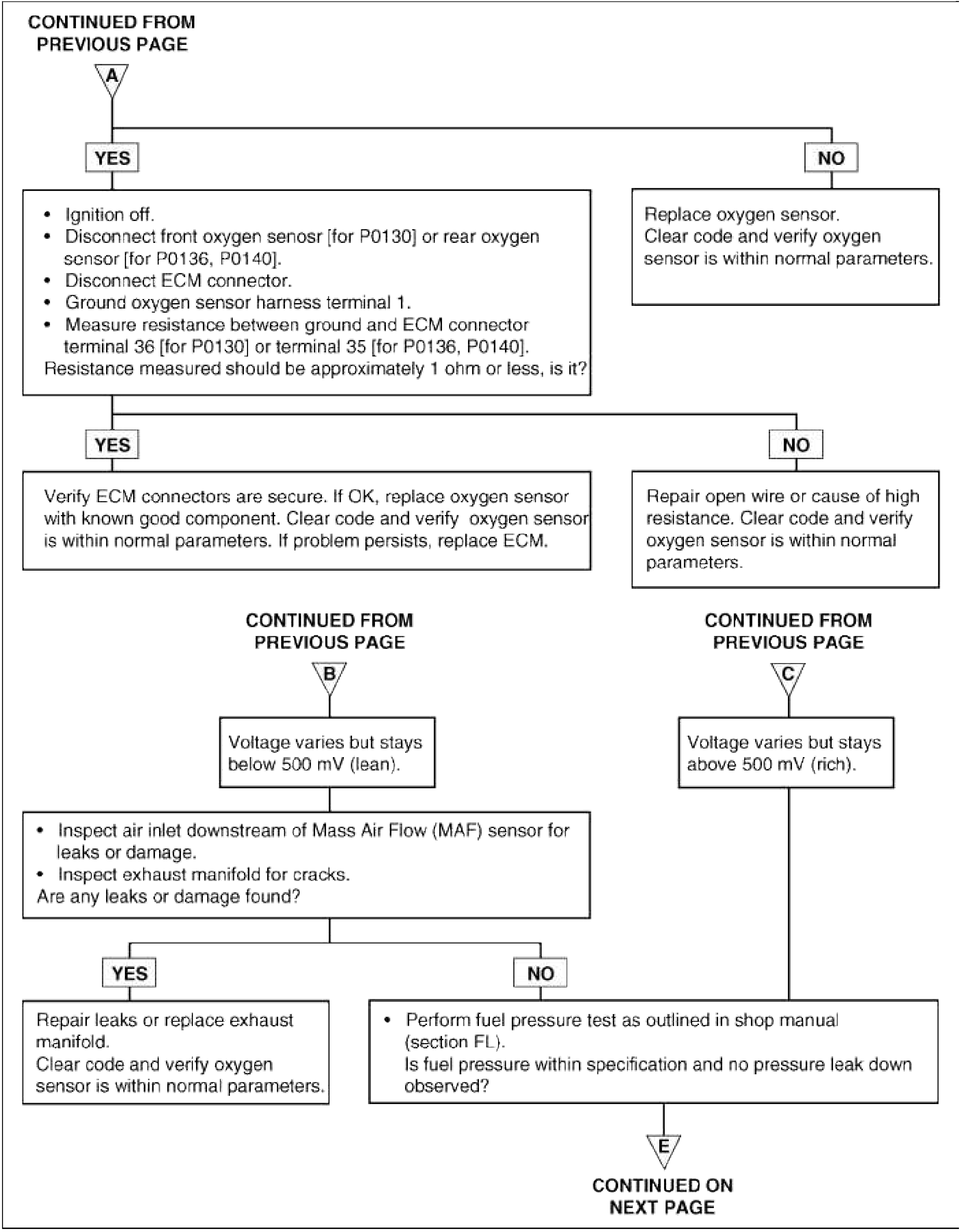
- Disconnect oxygen sensor connector.

Does voltage now read approximately 450 mV on scan tool?

For P0130 : Repair short to ground in wire between oxygen sensor harness connector terminal 1 and ECM connector terminal 36.
For P0136 : Repair short to ground in wire between
For P0140 oxygen sensor harness connector terminal 1 and ECM connector terminal 35.
Clear code and verify oxygen sensor is within normal parameters.

Replace oxygen sensor. Clear code and verify oxygen sensor is within normal parameters.

CONTINUED ON NEXT PAGE


CONTINUED FROM PREVIOUS PAGE
A
YES

- Ignition off.
- Disconnect front oxygen senosr [for P0130] or rear oxygen sensor [for P0136, P0140].
- Disconnect ECM connector.
- Ground oxygen sensor harness terminal 1.
- Measure resistance between ground and ECM connector terminal 36 [for P0130] or terminal 35 [for P0136, P0140].

Resistance measured should be approximately 1 ohm or less, is it?

YES

Verify ECM connectors are secure. If OK, replace oxygen sensor with known good component. Clear code and verify oxygen sensor is within normal parameters. If problem persists, replace ECM.

Repair open wire or cause of high resistance. Clear code and verify oxygen sensor is within normal parameters.

Replace oxygen sensor.
Clear code and verify oxygen sensor is within normal parameters.

CONTINUED FROM PREVIOUS PAGE
B

Voltage varies but stays below 500 mV (lean).

- Inspect air inlet downstream of Mass Air Flow (MAF) sensor for leaks or damage.
- Inspect exhaust manifold for cracks.

Are any leaks or damage found?

Repair leaks or replace exhaust manifold.
Clear code and verify oxygen sensor is within normal parameters.

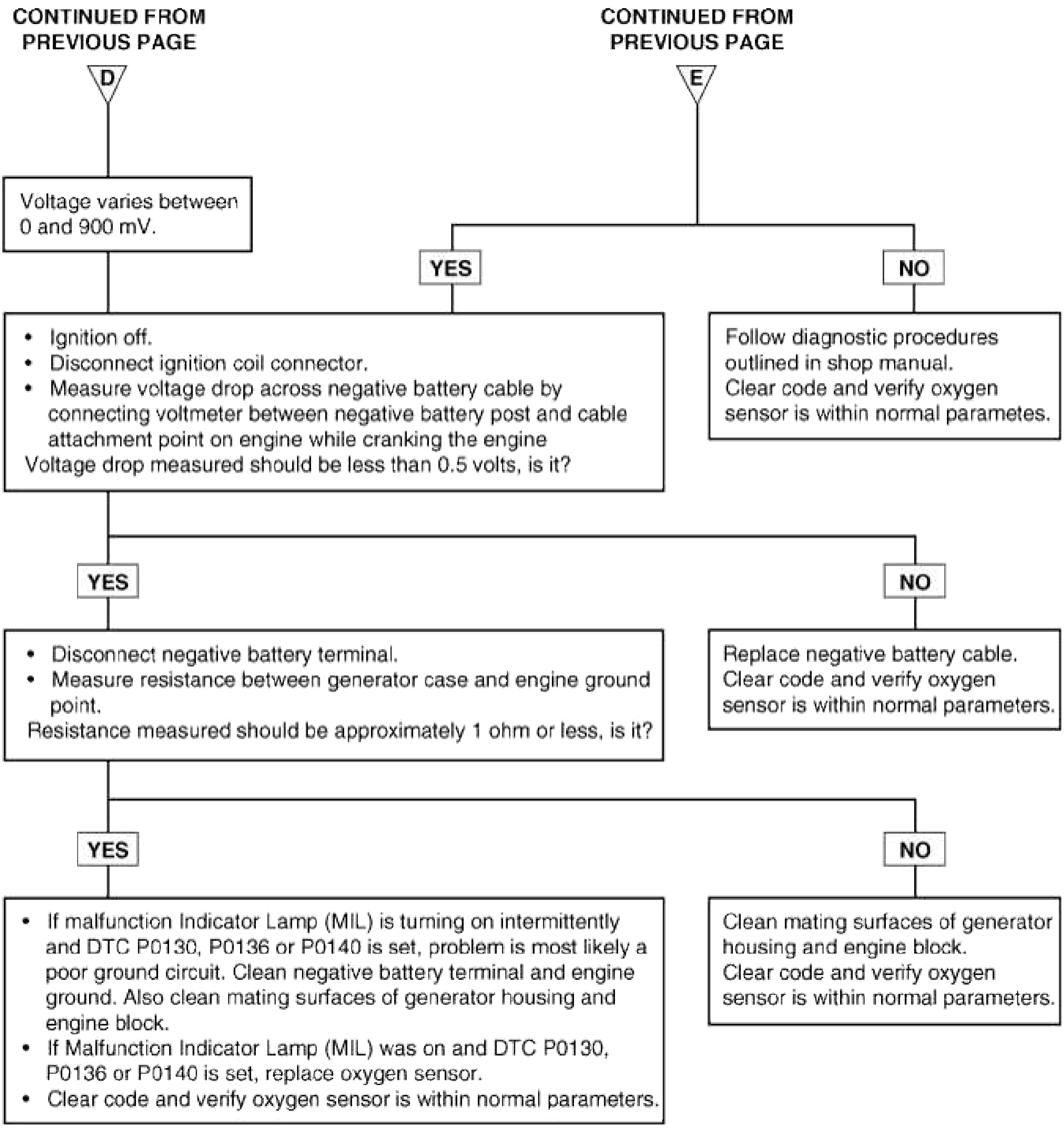
CONTINUED FROM PREVIOUS PAGE
C

Voltage varies but stays above 500 mV (rich).

- Perform fuel pressure test as outlined in shop manual (section FL).

Is fuel pressure within specification and no pressure leak down observed?

E
CONTINUED ON NEXT PAGE


CONTINUED FROM PREVIOUS PAGE
D
CONTINUED FROM PREVIOUS PAGE
E
Voltage varies between 0 and 900 mV.
YES
NO
• Ignition off.
• Disconnect ignition coil connector.
• Measure voltage drop across negative battery cable by connecting voltmeter between negative battery post and cable attachment point on engine while cranking the engine
Voltage drop measured should be less than 0.5 volts, is it?
Follow diagnostic procedures outlined in shop manual.
Clear code and verify oxygen sensor is within normal parametes.
YES
NO
• Disconnect negative battery terminal.
• Measure resistance between generator case and engine ground point.
Resistance measured should be approximately 1 ohm or less, is it?
Replace negative battery cable.
Clear code and verify oxygen sensor is within normal parameters.
YES
NO
• If malfunction Indicator Lamp (MIL) is turning on intermittently and DTC P0130, P0136 or P0140 is set, problem is most likely a poor ground circuit. Clean negative battery terminal and engine ground. Also clean mating surfaces of generator housing and engine block.
• If Malfunction Indicator Lamp (MIL) was on and DTC P0130, P0136 or P0140 is set, replace oxygen sensor.
• Clear code and verify oxygen sensor is within normal parameters.
Clean mating surfaces of generator housing and engine block.
Clear code and verify oxygen sensor is within normal parameters.

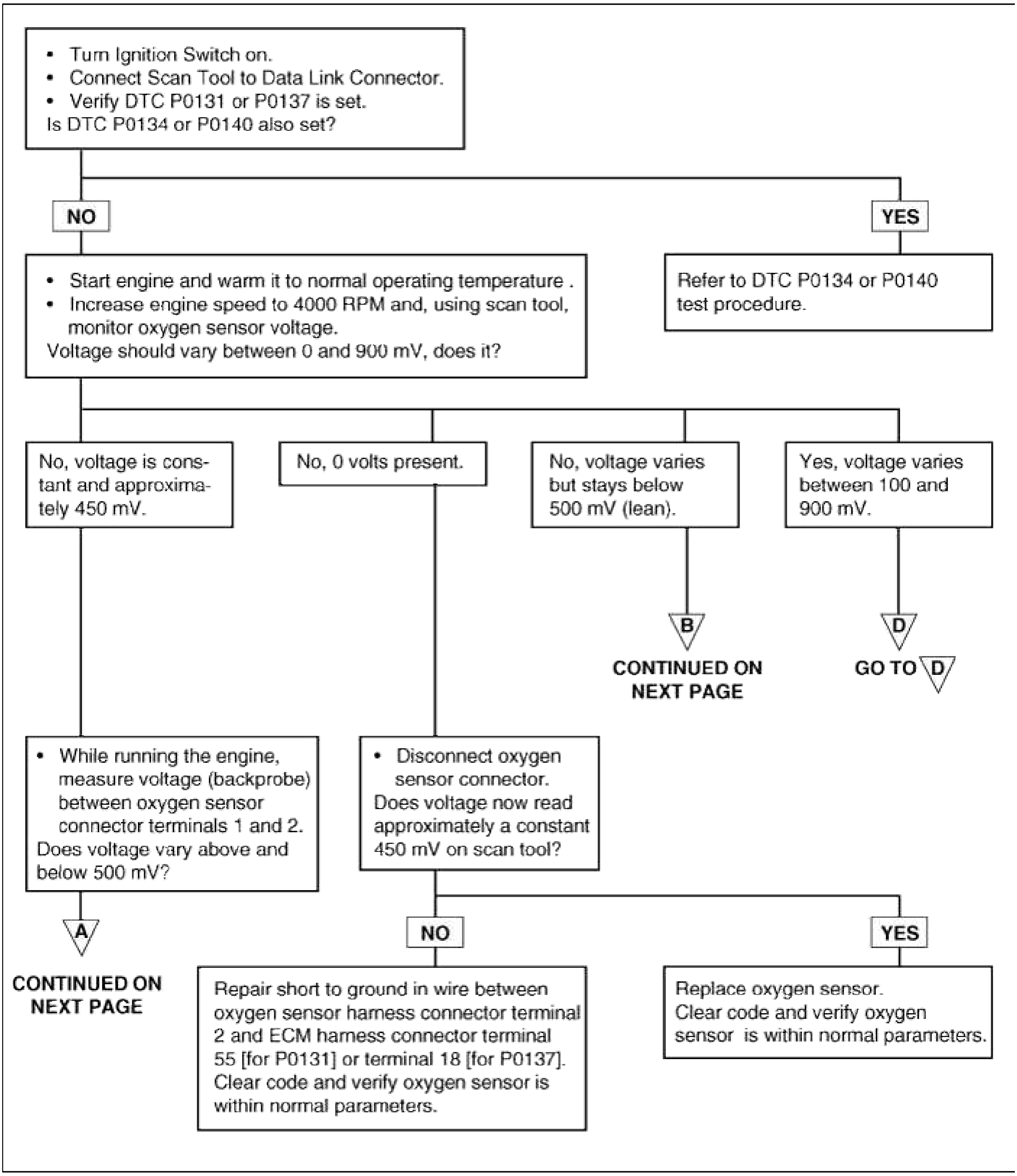
Fuel System > Troubleshooting > P0131

[P0131/P0137]

DTC	Diagnostic item
P0131 P0137	Oxygen Sensor Circuit Low Voltage (Bank 1, Sensor 1) Oxygen Sensor Circuit Low Voltage (Bank 1, Sensor 2)

DESCRIPTION
Refer to DTC P0130& P0136.

FAILURE CONDITIONS
TEST PROCEDURE



- Turn Ignition Switch on.
- Connect Scan Tool to Data Link Connector.
- Verify DTC P0131 or P0137 is set.

Is DTC P0134 or P0140 also set?

- Start engine and warm it to normal operating temperature .
- Increase engine speed to 4000 RPM and, using scan tool, monitor oxygen sensor voltage.

Voltage should vary between 0 and 900 mV, does it?

Refer to DTC P0134 or P0140 test procedure.

No, voltage is constant and approximately 450 mV.

No, 0 volts present.

No, voltage varies but stays below 500 mV (lean).

Yes, voltage varies between 100 and 900 mV.

- While running the engine, measure voltage (backprobe) between oxygen sensor connector terminals 1 and 2.

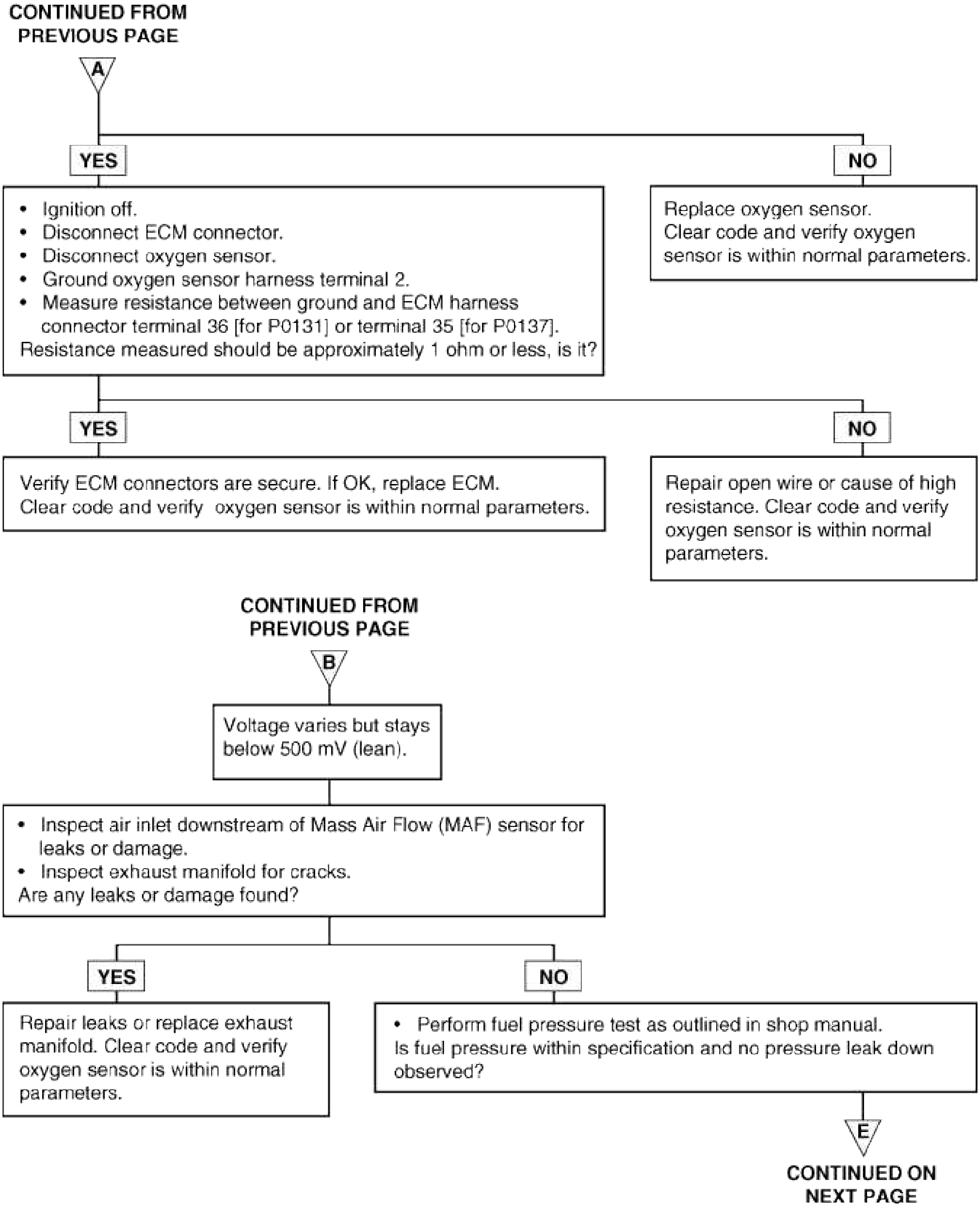
Does voltage vary above and below 500 mV?

- Disconnect oxygen sensor connector.

Does voltage now read approximately a constant 450 mV on scan tool?

Repair short to ground in wire between oxygen sensor harness connector terminal 2 and ECM harness connector terminal 55 [for P0131] or terminal 18 [for P0137]. Clear code and verify oxygen sensor is within normal parameters.

Replace oxygen sensor. Clear code and verify oxygen sensor is within normal parameters.



CONTINUED FROM PREVIOUS PAGE

- Ignition off.
- Disconnect ECM connector.
- Disconnect oxygen sensor.
- Ground oxygen sensor harness terminal 2.
- Measure resistance between ground and ECM harness connector terminal 36 [for P0131] or terminal 35 [for P0137].

Resistance measured should be approximately 1 ohm or less, is it?

Replace oxygen sensor. Clear code and verify oxygen sensor is within normal parameters.

Verify ECM connectors are secure. If OK, replace ECM. Clear code and verify oxygen sensor is within normal parameters.

Repair open wire or cause of high resistance. Clear code and verify oxygen sensor is within normal parameters.

CONTINUED FROM PREVIOUS PAGE

Voltage varies but stays below 500 mV (lean).

- Inspect air inlet downstream of Mass Air Flow (MAF) sensor for leaks or damage.
- Inspect exhaust manifold for cracks.

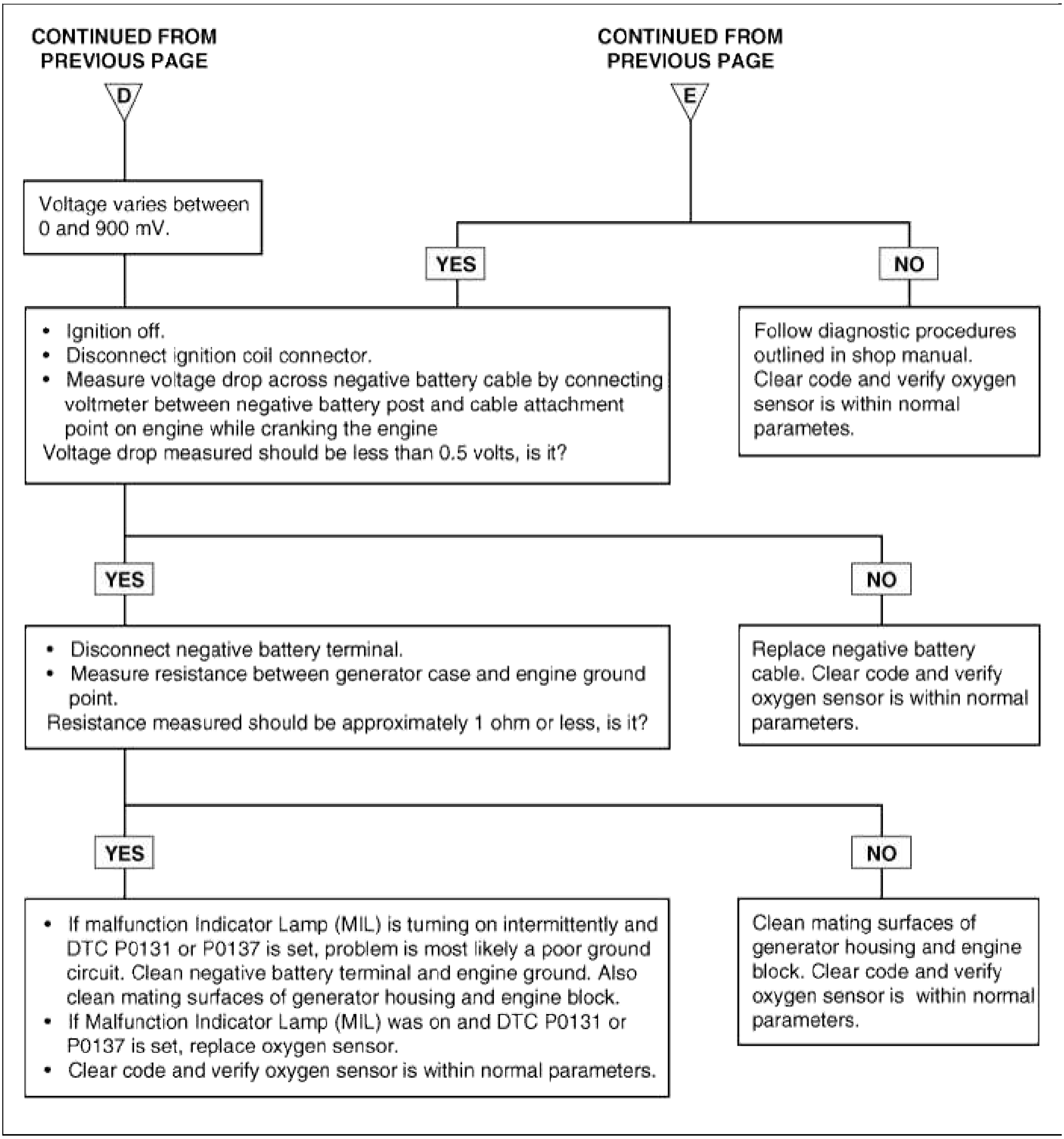
Are any leaks or damage found?

Repair leaks or replace exhaust manifold. Clear code and verify oxygen sensor is within normal parameters.

- Perform fuel pressure test as outlined in shop manual.

Is fuel pressure within specification and no pressure leak down observed?

CONTINUED ON NEXT PAGE



Voltage varies between 0 and 900 mV.

- Ignition off.
- Disconnect ignition coil connector.
- Measure voltage drop across negative battery cable by connecting voltmeter between negative battery post and cable attachment point on engine while cranking the engine

Voltage drop measured should be less than 0.5 volts, is it?

Follow diagnostic procedures outlined in shop manual. Clear code and verify oxygen sensor is within normal parametes.

- Disconnect negative battery terminal.
- Measure resistance between generator case and engine ground point.

Resistance measured should be approximately 1 ohm or less, is it?

Replace negative battery cable. Clear code and verify oxygen sensor is within normal parameters.

- If malfunction Indicator Lamp (MIL) is turning on intermittently and DTC P0131 or P0137 is set, problem is most likely a poor ground circuit. Clean negative battery terminal and engine ground. Also clean mating surfaces of generator housing and engine block.
- If Malfunction Indicator Lamp (MIL) was on and DTC P0131 or P0137 is set, replace oxygen sensor.
- Clear code and verify oxygen sensor is within normal parameters.

Clean mating surfaces of generator housing and engine block. Clear code and verify oxygen sensor is within normal parameters.

Fuel System > Troubleshooting > P0132

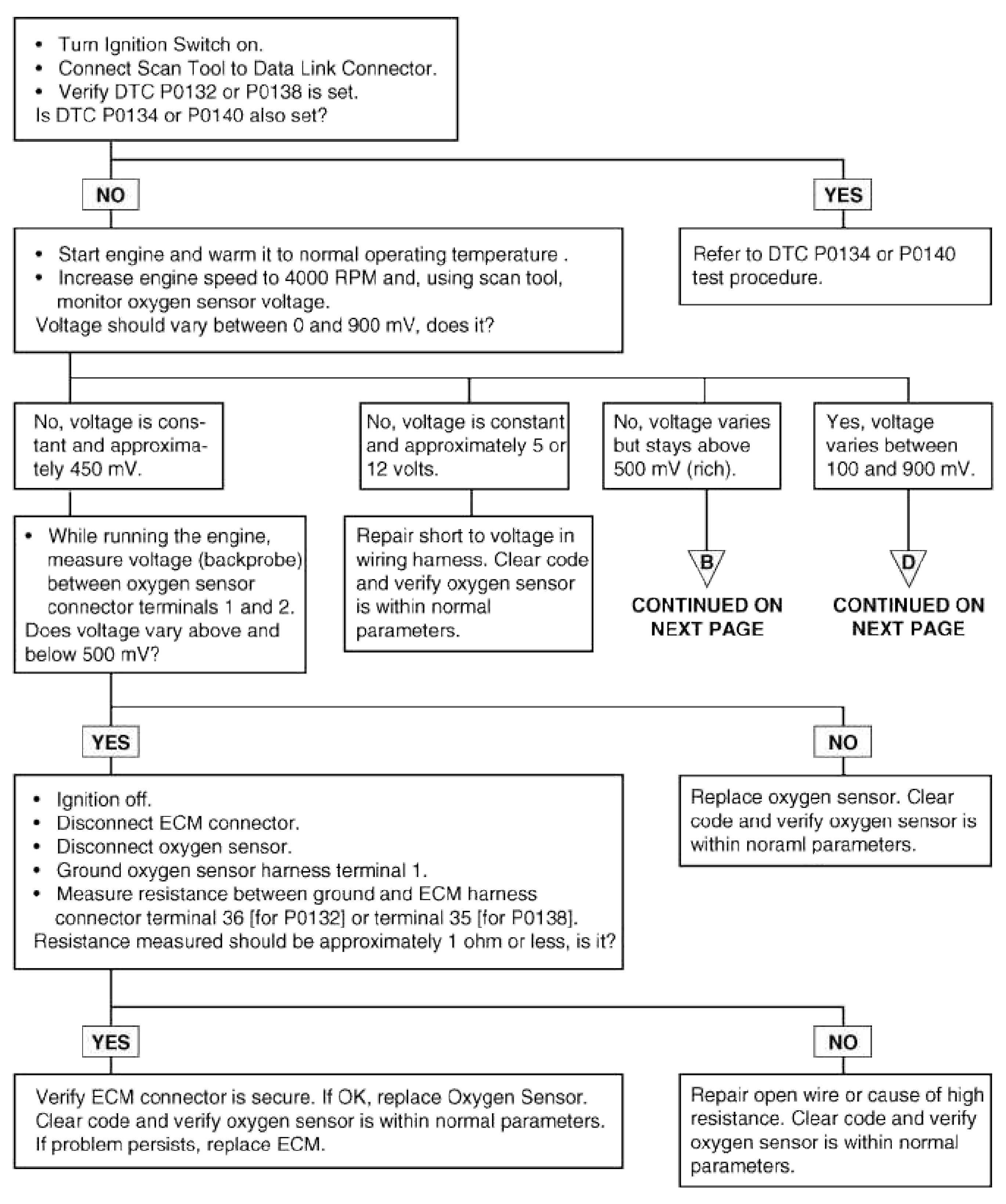
[P0132/P0138]

DTC	Diagnostic item
P0132 P0138	Oxygen Sensor Circuit High Voltage (Bank 1, Sensor 1) Oxygen Sensor Circuit High Voltage (Bank 1, Sensor 2)

DESCRIPTION
Refer to DTC P0130& P0136.

FAILURE CONDITIONS

TEST PROCEDURE



- Turn Ignition Switch on.
- Connect Scan Tool to Data Link Connector.
- Verify DTC P0132 or P0138 is set.

Is DTC P0134 or P0140 also set?

Refer to DTC P0134 or P0140 test procedure.

- Start engine and warm it to normal operating temperature .
- Increase engine speed to 4000 RPM and, using scan tool, monitor oxygen sensor voltage.

Voltage should vary between 0 and 900 mV, does it?

No, voltage is constant and approximately 450 mV.

No, voltage is constant and approximately 5 or 12 volts.

No, voltage varies but stays above 500 mV (rich).

Yes, voltage varies between 100 and 900 mV.

- While running the engine, measure voltage (backprobe) between oxygen sensor connector terminals 1 and 2.

Does voltage vary above and below 500 mV?

Repair short to voltage in wiring harness. Clear code and verify oxygen sensor is within normal parameters.

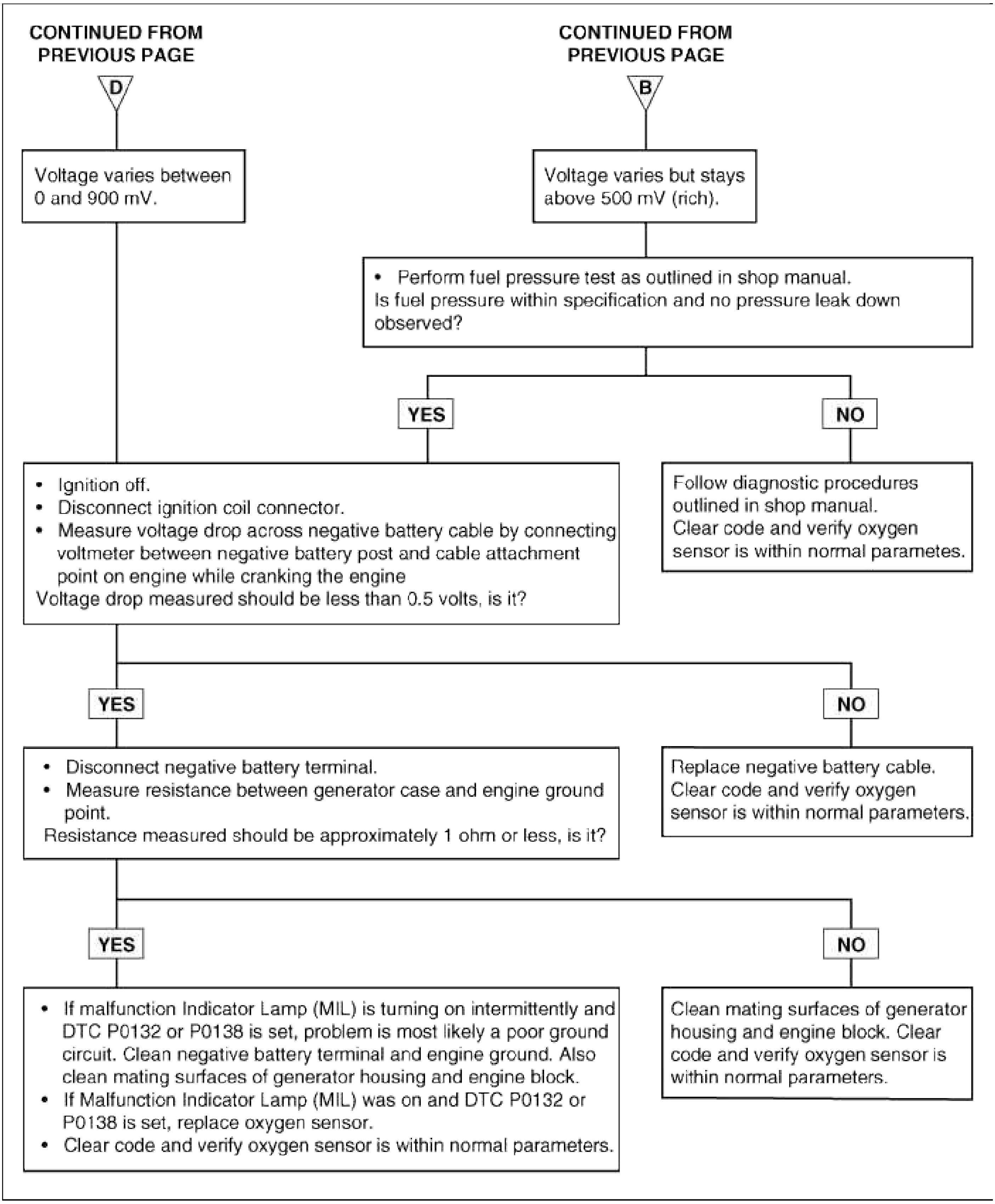
Replace oxygen sensor. Clear code and verify oxygen sensor is within noraml parameters.

- Ignition off.
- Disconnect ECM connector.
- Disconnect oxygen sensor.
- Ground oxygen sensor harness terminal 1.
- Measure resistance between ground and ECM harness connector terminal 36 [for P0132] or terminal 35 [for P0138].

Resistance measured should be approximately 1 ohm or less, is it?

Verify ECM connector is secure. If OK, replace Oxygen Sensor. Clear code and verify oxygen sensor is within normal parameters. If problem persists, replace ECM.

Repair open wire or cause of high resistance. Clear code and verify oxygen sensor is within normal parameters.



Voltage varies between 0 and 900 mV.

Voltage varies but stays above 500 mV (rich).

- Perform fuel pressure test as outlined in shop manual.

Is fuel pressure within specification and no pressure leak down observed?

Follow diagnostic procedures outlined in shop manual. Clear code and verify oxygen sensor is within normal parametes.

- Ignition off.
- Disconnect ignition coil connector.
- Measure voltage drop across negative battery cable by connecting voltmeter between negative battery post and cable attachment point on engine while cranking the engine

Voltage drop measured should be less than 0.5 volts, is it?

Replace negative battery cable. Clear code and verify oxygen sensor is within normal parameters.

- Disconnect negative battery terminal.
- Measure resistance between generator case and engine ground point.

Resistance measured should be approximately 1 ohm or less, is it?

Clean mating surfaces of generator housing and engine block. Clear code and verify oxygen sensor is within normal parameters.

- If malfunction Indicator Lamp (MIL) is turning on intermittently and DTC P0132 or P0138 is set, problem is most likely a poor ground circuit. Clean negative battery terminal and engine ground. Also clean mating surfaces of generator housing and engine block.
- If Malfunction Indicator Lamp (MIL) was on and DTC P0132 or P0138 is set, replace oxygen sensor.
- Clear code and verify oxygen sensor is within normal parameters.

Fuel System > Troubleshooting > P0133

[P0133/P0134]

DTC	Diagnostic item
P0133 P0134	Oxygen Sensor Circuit Slow Respones (Bank 1, Sensor 1) Oxygen Sensor Circuit No Activity Detected (Bank 1, Sensor 1)

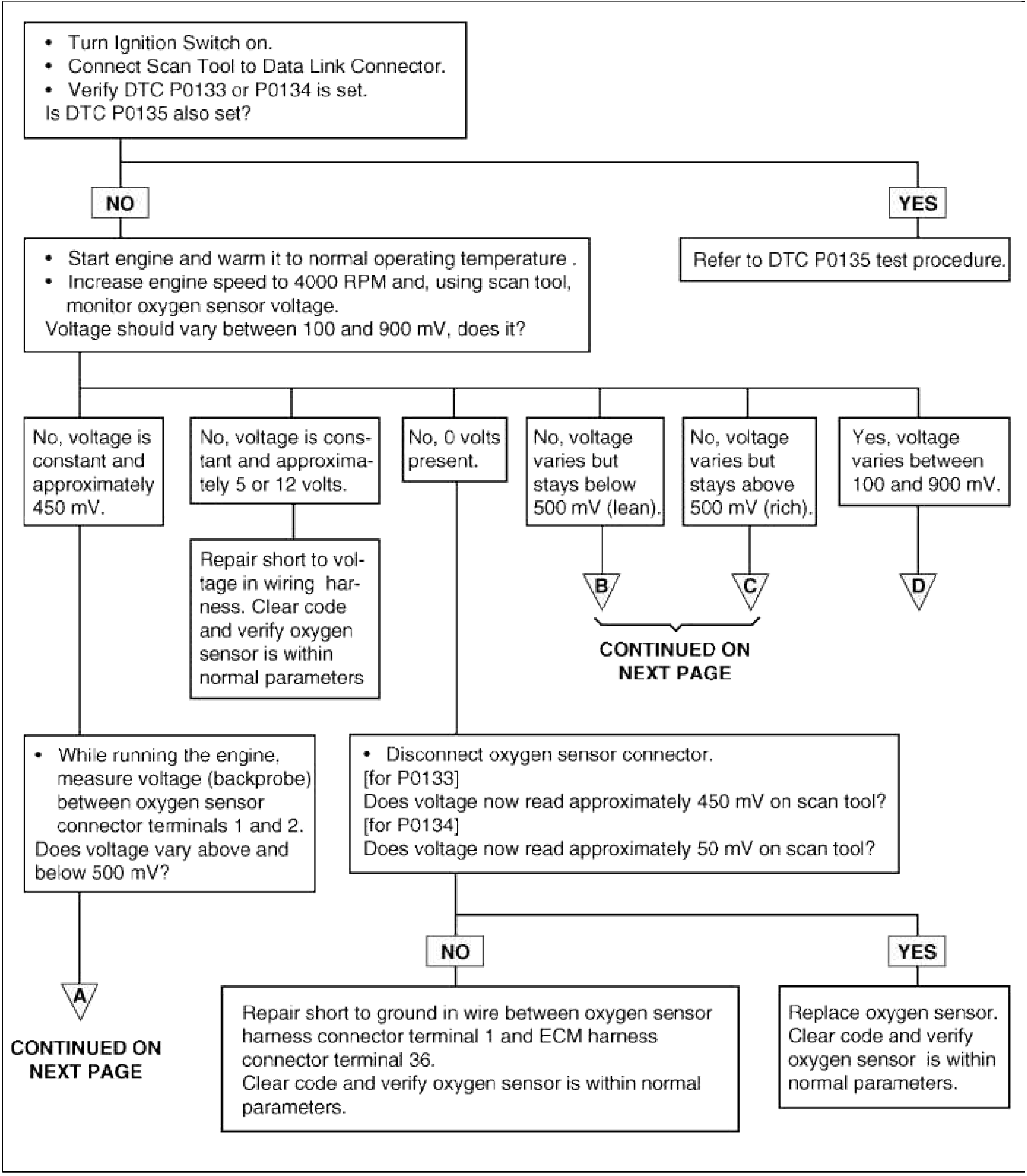
DESCRIPTION

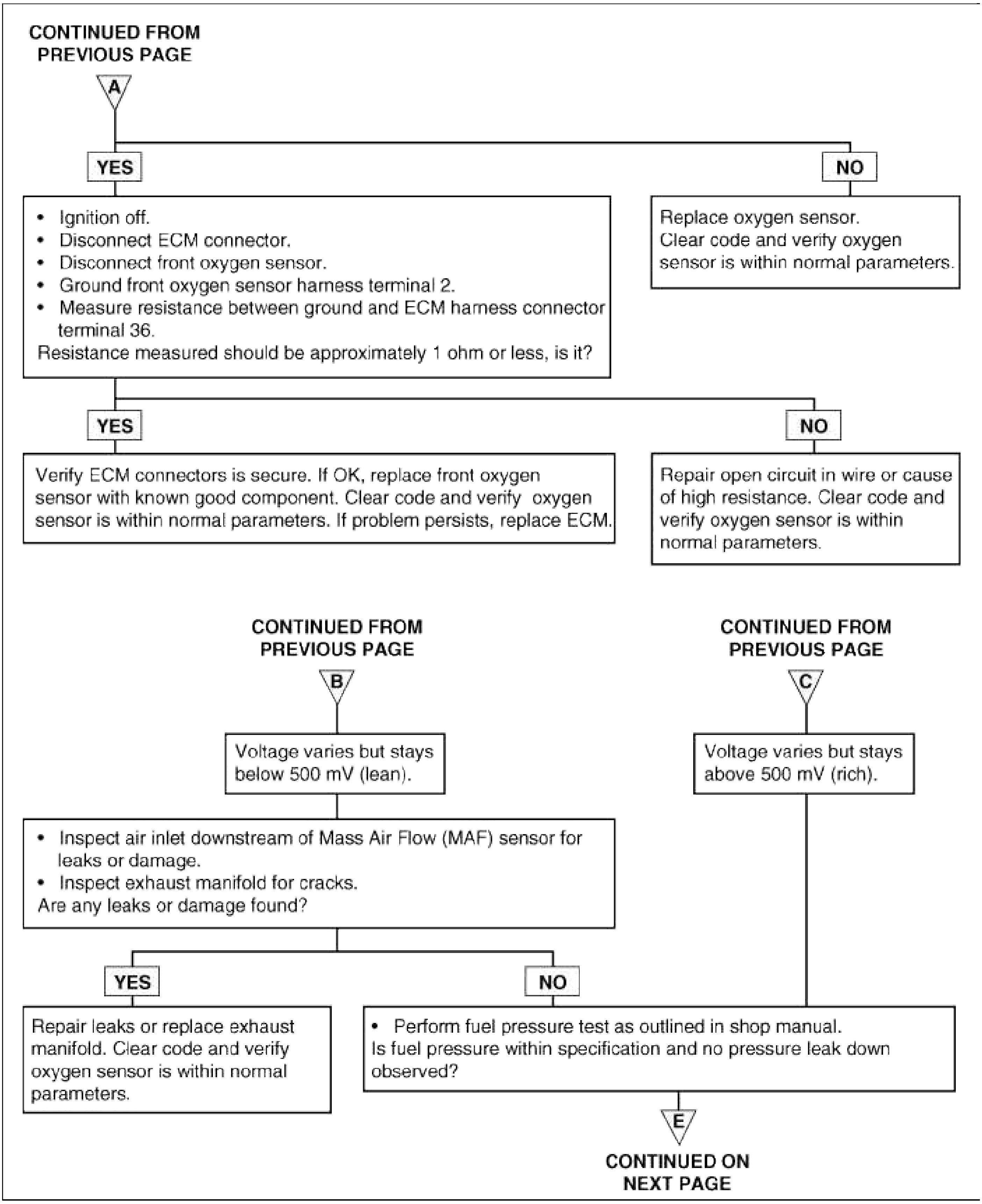
Refer to DTC P0130 & P0136.

FAILURE CONDITIONS

1. Over a period of 2 minutes, the ECM must sense a fuel compensation factor greater 85% or less than 95%.
2. The ECM must make some correction in the air/fuel ratio when :
   - Engine RPM is between 1600 and 3200 RPM.
   - Engine load range is between 1.35 and 3.4 milliseconds.
   - Catalyst temperature is above 372°C (702°F).
   - System is in closed loop.

TEST PROCEDURE


• Turn Ignition Switch on.
• Connect Scan Tool to Data Link Connector.
• Verify DTC P0133 or P0134 is set.
Is DTC P0135 also set?
NO
YES
Refer to DTC P0135 test procedure.
• Start engine and warm it to normal operating temperature .
• Increase engine speed to 4000 RPM and, using scan tool, monitor oxygen sensor voltage.
Voltage should vary between 100 and 900 mV, does it?
No, voltage is constant and approximately 450 mV.
No, voltage is constant and approximately 5 or 12 volts.
No, 0 volts present.
No, voltage varies but stays below 500 mV (lean).
No, voltage varies but stays above 500 mV (rich).
Yes, voltage varies between 100 and 900 mV.
Repair short to voltage in wiring harness. Clear code and verify oxygen sensor is within normal parameters
B
C
D
CONTINUED ON NEXT PAGE
• While running the engine, measure voltage (backprobe) between oxygen sensor connector terminals 1 and 2.
Does voltage vary above and below 500 mV?
• Disconnect oxygen sensor connector.
[for P0133]
Does voltage now read approximately 450 mV on scan tool?
[for P0134]
Does voltage now read approximately 50 mV on scan tool?
NO
YES
A
CONTINUED ON NEXT PAGE
Repair short to ground in wire between oxygen sensor harness connector terminal 1 and ECM harness connector terminal 36.
Clear code and verify oxygen sensor is within normal parameters.
Replace oxygen sensor. Clear code and verify oxygen sensor is within normal parameters.


CONTINUED FROM PREVIOUS PAGE
A
YES
NO
YES
NO
CONTINUED FROM PREVIOUS PAGE
B
CONTINUED FROM PREVIOUS PAGE
C
YES
NO
E
CONTINUED ON NEXT PAGE

- Ignition off.
- Disconnect ECM connector.
- Disconnect front oxygen sensor.
- Ground front oxygen sensor harness terminal 2.
- Measure resistance between ground and ECM harness connector terminal 36.

Resistance measured should be approximately 1 ohm or less, is it?

Replace oxygen sensor. Clear code and verify oxygen sensor is within normal parameters.

Verify ECM connectors is secure. If OK, replace front oxygen sensor with known good component. Clear code and verify oxygen sensor is within normal parameters. If problem persists, replace ECM.

Repair open circuit in wire or cause of high resistance. Clear code and verify oxygen sensor is within normal parameters.

Voltage varies but stays below 500 mV (lean).

Voltage varies but stays above 500 mV (rich).

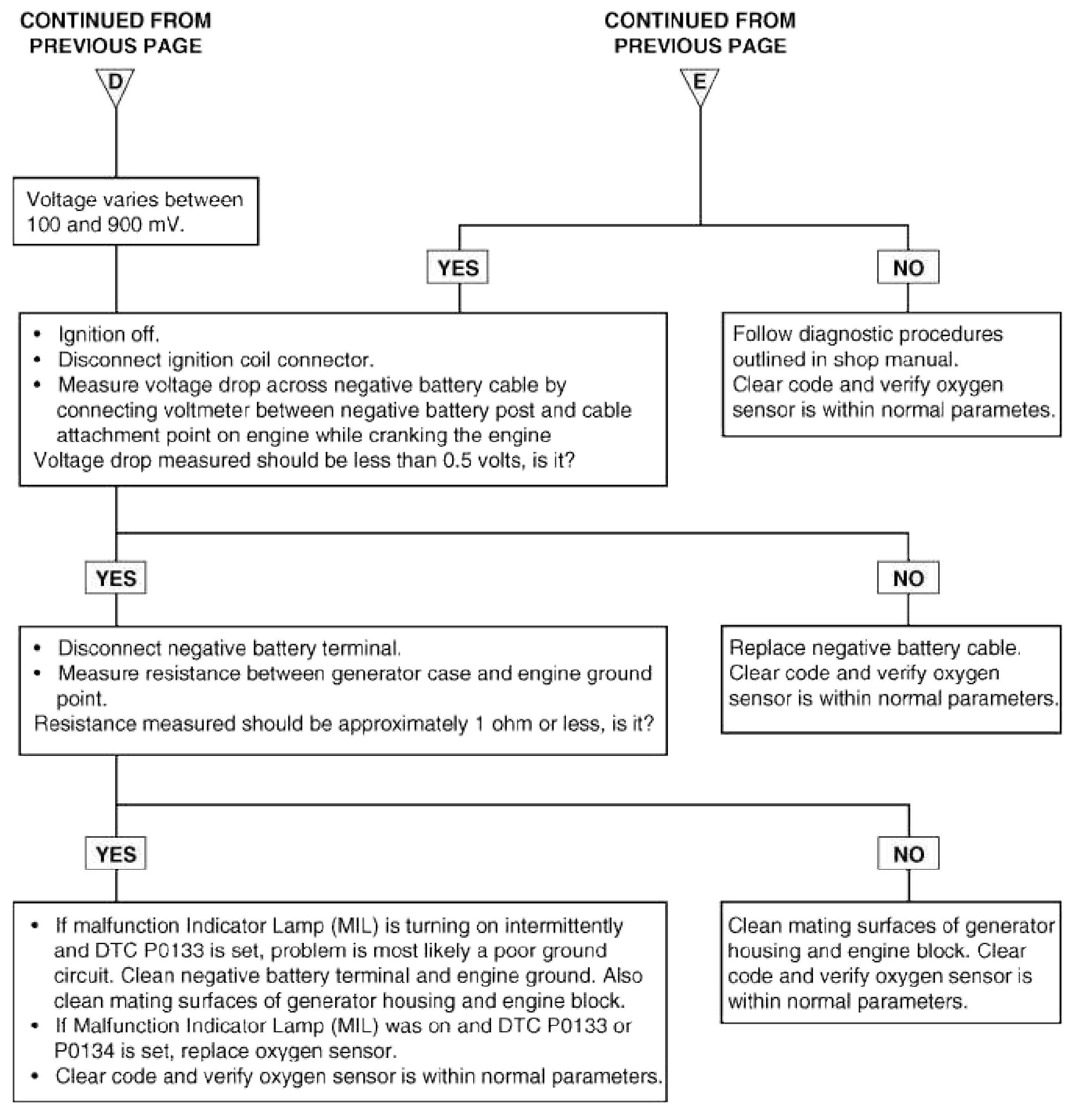
- Inspect air inlet downstream of Mass Air Flow (MAF) sensor for leaks or damage.
- Inspect exhaust manifold for cracks.

Are any leaks or damage found?

Repair leaks or replace exhaust manifold. Clear code and verify oxygen sensor is within normal parameters.

- Perform fuel pressure test as outlined in shop manual.

Is fuel pressure within specification and no pressure leak down observed?


CONTINUED FROM PREVIOUS PAGE
D
CONTINUED FROM PREVIOUS PAGE
E
Voltage varies between 100 and 900 mV.
YES
NO
• Ignition off.
• Disconnect ignition coil connector.
• Measure voltage drop across negative battery cable by connecting voltmeter between negative battery post and cable attachment point on engine while cranking the engine
Voltage drop measured should be less than 0.5 volts, is it?
Follow diagnostic procedures outlined in shop manual. Clear code and verify oxygen sensor is within normal parametes.
YES
NO
• Disconnect negative battery terminal.
• Measure resistance between generator case and engine ground point.
Resistance measured should be approximately 1 ohm or less, is it?
Replace negative battery cable. Clear code and verify oxygen sensor is within normal parameters.
YES
NO
• If malfunction Indicator Lamp (MIL) is turning on intermittently and DTC P0133 is set, problem is most likely a poor ground circuit. Clean negative battery terminal and engine ground. Also clean mating surfaces of generator housing and engine block.
• If Malfunction Indicator Lamp (MIL) was on and DTC P0133 or P0134 is set, replace oxygen sensor.
• Clear code and verify oxygen sensor is within normal parameters.
Clean mating surfaces of generator housing and engine block. Clear code and verify oxygen sensor is within normal parameters.

Fuel System > Troubleshooting > P0134

[P0133/P0134]

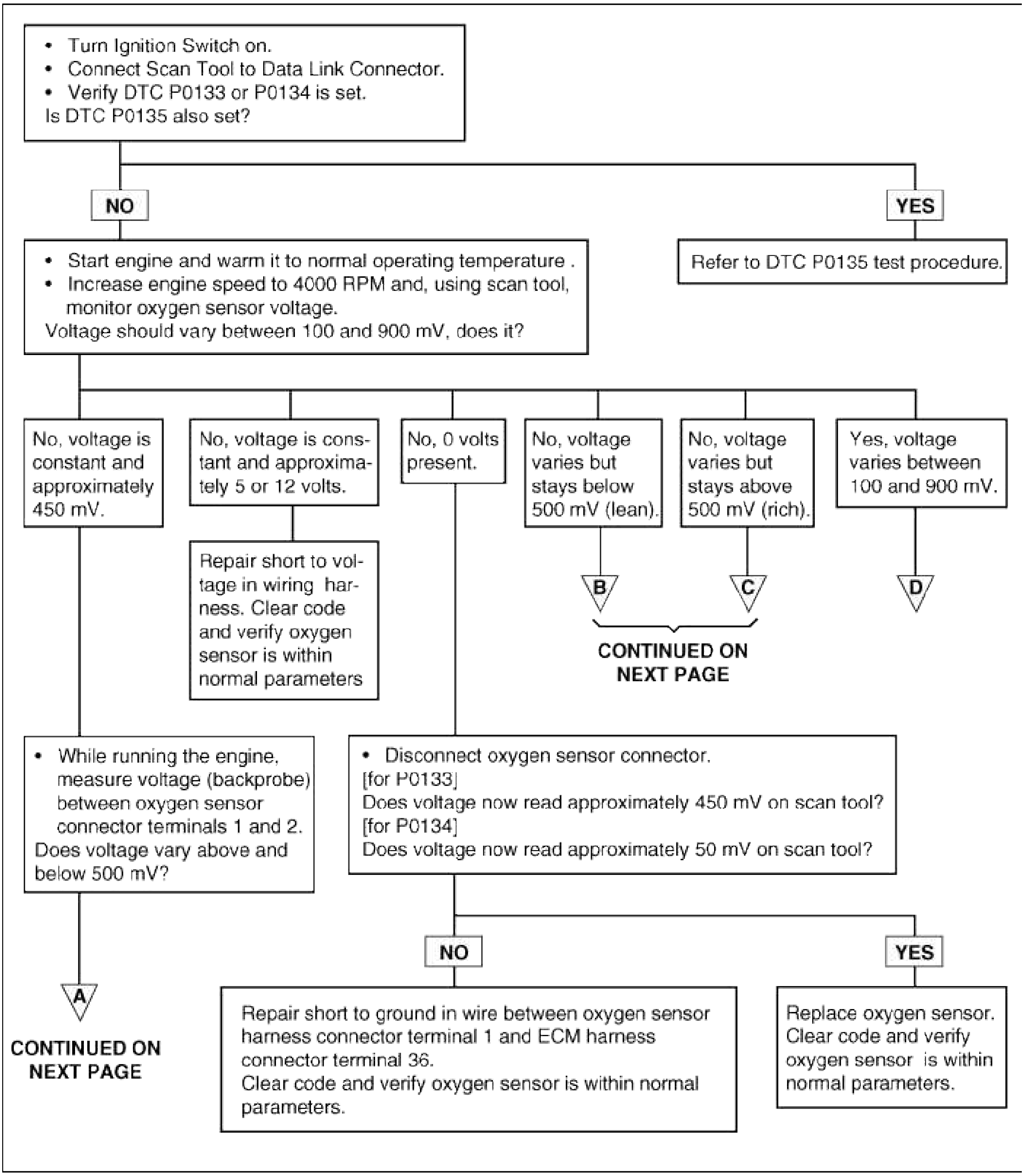
DTC	Diagnostic item
P0133 P0134	Oxygen Sensor Circuit Slow Respones (Bank 1, Sensor 1) Oxygen Sensor Circuit No Activity Detected (Bank 1, Sensor 1)

DESCRIPTION
Refer to DTC P0130 & P0136.

FAILURE CONDITIONS

1. Over a period of 2 minutes, the ECM must sense a fuel compensation factor greater 85% or less than 95%.
2. The ECM must make some correction in the air/fuel ratio when :
   - Engine RPM is between 1600 and 3200 RPM.
   - Engine load range is between 1.35 and 3.4 milliseconds.
   - Catalyst temperature is above 372°C (702°F).
   - System is in closed loop.

TEST PROCEDURE



- Turn Ignition Switch on.
- Connect Scan Tool to Data Link Connector.
- Verify DTC P0133 or P0134 is set.

Is DTC P0135 also set?

NO

- Start engine and warm it to normal operating temperature .
- Increase engine speed to 4000 RPM and, using scan tool, monitor oxygen sensor voltage.

Voltage should vary between 100 and 900 mV, does it?

YES

Refer to DTC P0135 test procedure.

No, voltage is constant and approximately 450 mV.

No, voltage is constant and approximately 5 or 12 volts.

No, 0 volts present.

No, voltage varies but stays below 500 mV (lean).

No, voltage varies but stays above 500 mV (rich).

Yes, voltage varies between 100 and 900 mV.

Repair short to voltage in wiring harness. Clear code and verify oxygen sensor is within normal parameters

CONTINUED ON NEXT PAGE

- While running the engine, measure voltage (backprobe) between oxygen sensor connector terminals 1 and 2.

Does voltage vary above and below 500 mV?

- Disconnect oxygen sensor connector.

[for P0133]
Does voltage now read approximately 450 mV on scan tool?
[for P0134]
Does voltage now read approximately 50 mV on scan tool?

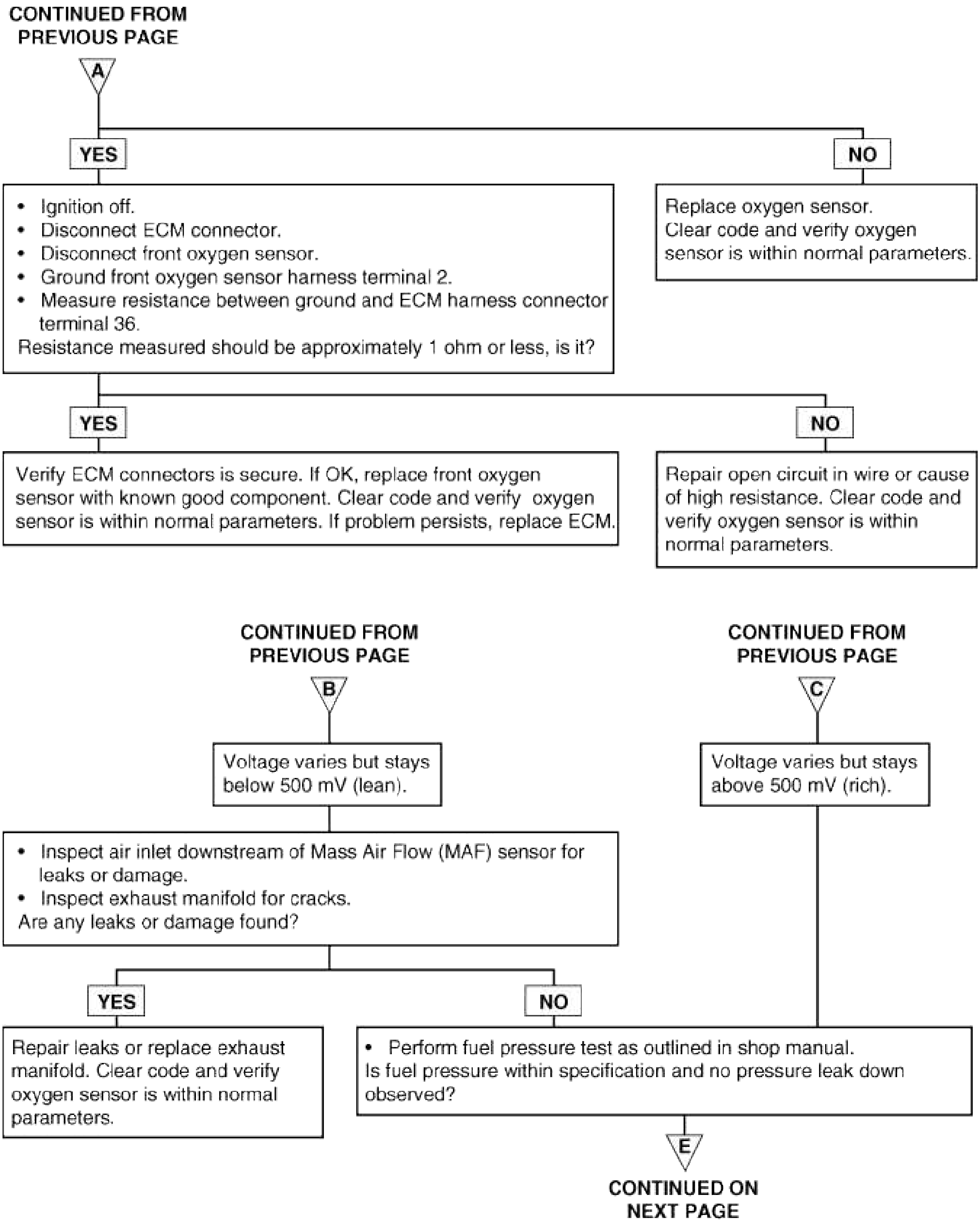
NO

YES

CONTINUED ON NEXT PAGE

Repair short to ground in wire between oxygen sensor harness connector terminal 1 and ECM harness connector terminal 36.
Clear code and verify oxygen sensor is within normal parameters.

Replace oxygen sensor. Clear code and verify oxygen sensor is within normal parameters.



CONTINUED FROM PREVIOUS PAGE

- Ignition off.
- Disconnect ECM connector.
- Disconnect front oxygen sensor.
- Ground front oxygen sensor harness terminal 2.
- Measure resistance between ground and ECM harness connector terminal 36.

Resistance measured should be approximately 1 ohm or less, is it?

Replace oxygen sensor. Clear code and verify oxygen sensor is within normal parameters.

Verify ECM connectors is secure. If OK, replace front oxygen sensor with known good component. Clear code and verify oxygen sensor is within normal parameters. If problem persists, replace ECM.

Repair open circuit in wire or cause of high resistance. Clear code and verify oxygen sensor is within normal parameters.

CONTINUED FROM PREVIOUS PAGE

Voltage varies but stays below 500 mV (lean).

CONTINUED FROM PREVIOUS PAGE

Voltage varies but stays above 500 mV (rich).

- Inspect air inlet downstream of Mass Air Flow (MAF) sensor for leaks or damage.
- Inspect exhaust manifold for cracks.

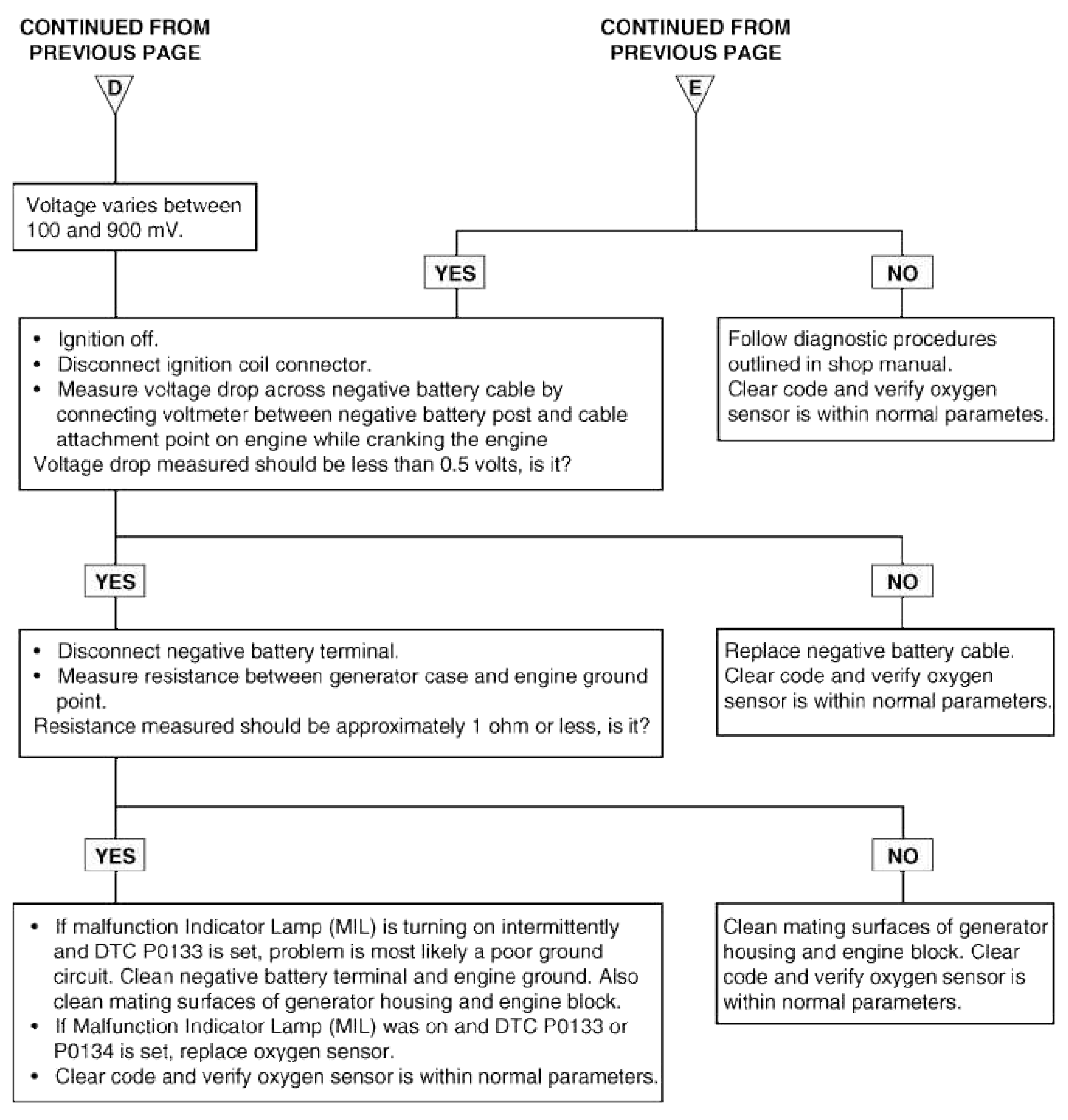
Are any leaks or damage found?

Repair leaks or replace exhaust manifold. Clear code and verify oxygen sensor is within normal parameters.

- Perform fuel pressure test as outlined in shop manual.

Is fuel pressure within specification and no pressure leak down observed?

CONTINUED ON NEXT PAGE



Voltage varies between 100 and 900 mV.

- Ignition off.
- Disconnect ignition coil connector.
- Measure voltage drop across negative battery cable by connecting voltmeter between negative battery post and cable attachment point on engine while cranking the engine

Voltage drop measured should be less than 0.5 volts, is it?

Follow diagnostic procedures outlined in shop manual. Clear code and verify oxygen sensor is within normal parametes.

- Disconnect negative battery terminal.
- Measure resistance between generator case and engine ground point.

Resistance measured should be approximately 1 ohm or less, is it?

Replace negative battery cable. Clear code and verify oxygen sensor is within normal parameters.

- If malfunction Indicator Lamp (MIL) is turning on intermittently and DTC P0133 is set, problem is most likely a poor ground circuit. Clean negative battery terminal and engine ground. Also clean mating surfaces of generator housing and engine block.
- If Malfunction Indicator Lamp (MIL) was on and DTC P0133 or P0134 is set, replace oxygen sensor.
- Clear code and verify oxygen sensor is within normal parameters.

Clean mating surfaces of generator housing and engine block. Clear code and verify oxygen sensor is within normal parameters.

Fuel System > Troubleshooting > P0136

[P0130/P0136/P0140]

DTC	Diagnostic item
P0130 P0136 P0140	Oxygen Sensor Circuit Malfunction (Bank 1, Sensor 1) Oxygen Sensor Circuit Malfunction (Bank 1, Sensor 2) Oxygen Sensor Circuit No Activity (Bank 1, Sensor 2)

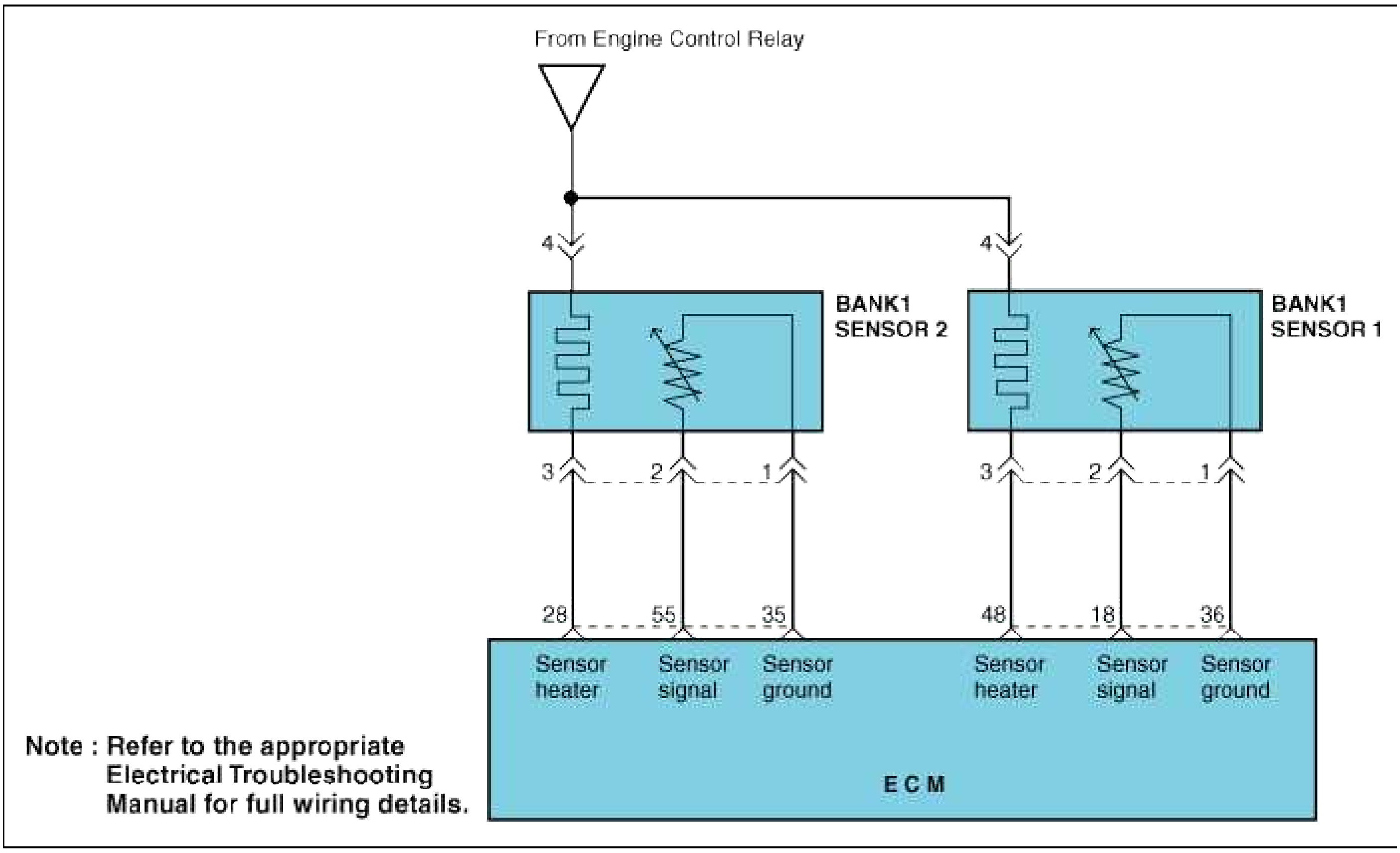
DESCRIPTION

The Engine Control Module (ECM) uses oxygen sensor signals to maintain the air fuel mixture at the ratio resulting in optimum fuel economy and reduced emissions. The amount of oxygen in the exhaust gases indicates, to the front oxygen sensor, whether the air fuel mixture being supplied to the engine cylinders is rich or lean. The readings of the rear oxygen sensor are used to indicate the efficiency of the catalytic converter. The ECM calculates catalytic converter efficiency by comparing the rear oxygen sensor signal to the front oxygen sensor signal.

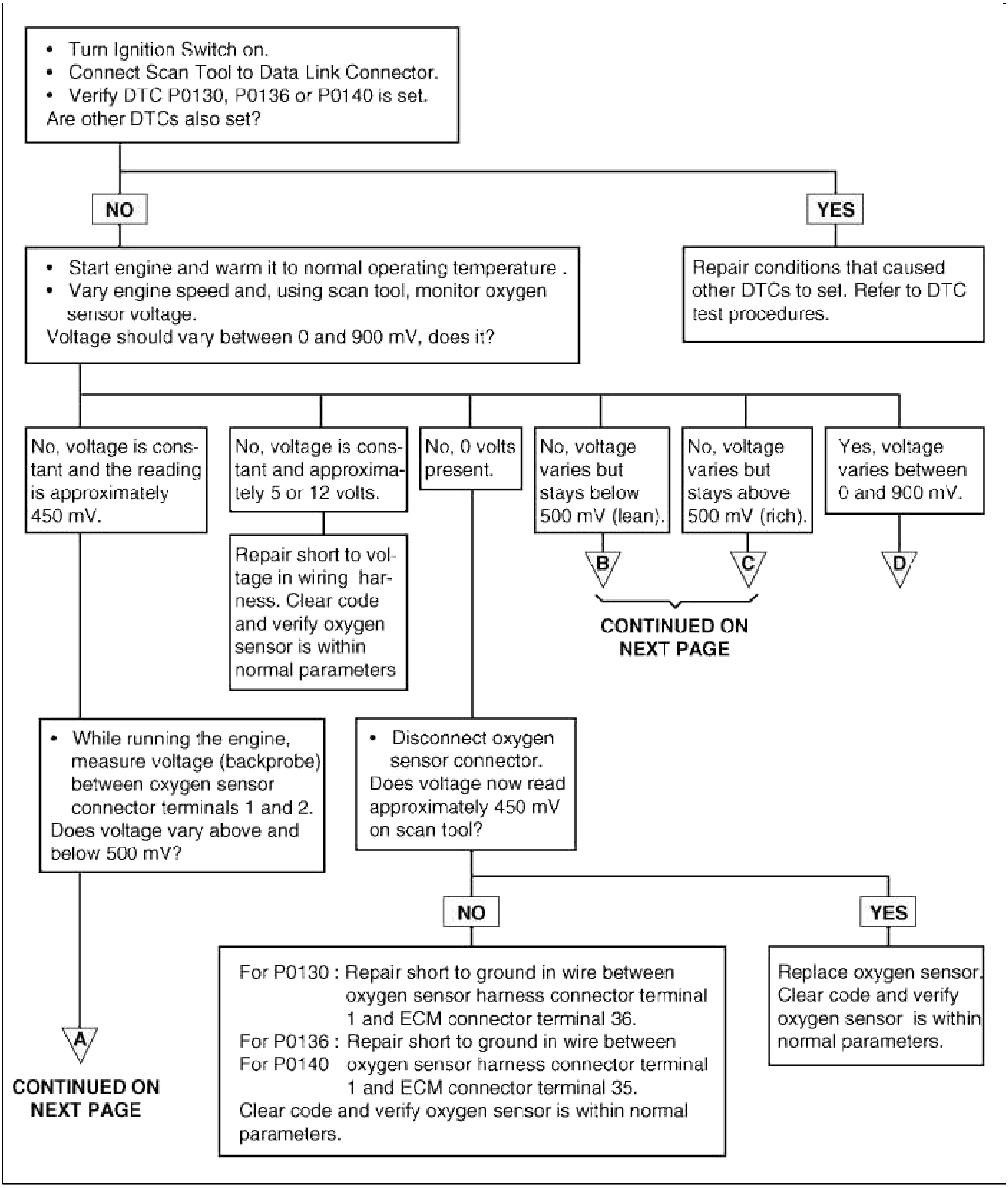
A normal oxygen sensor signal will constantly fluctuate above and below 500 mV, with the front oxygen sensor signal frequency of at least 5Hz at 2500 RPM. Due to the effect of the catalytic converter, the rear oxygen sensor signal frequency will be lower than the front oxygen sensor signal frequency. If the rear oxygen sensor signal coincides with the front oxygen sensor signal a large percentage of the time, this indicates a loss in efficiency of the catalytic converter or a malfunction within the fuel system.

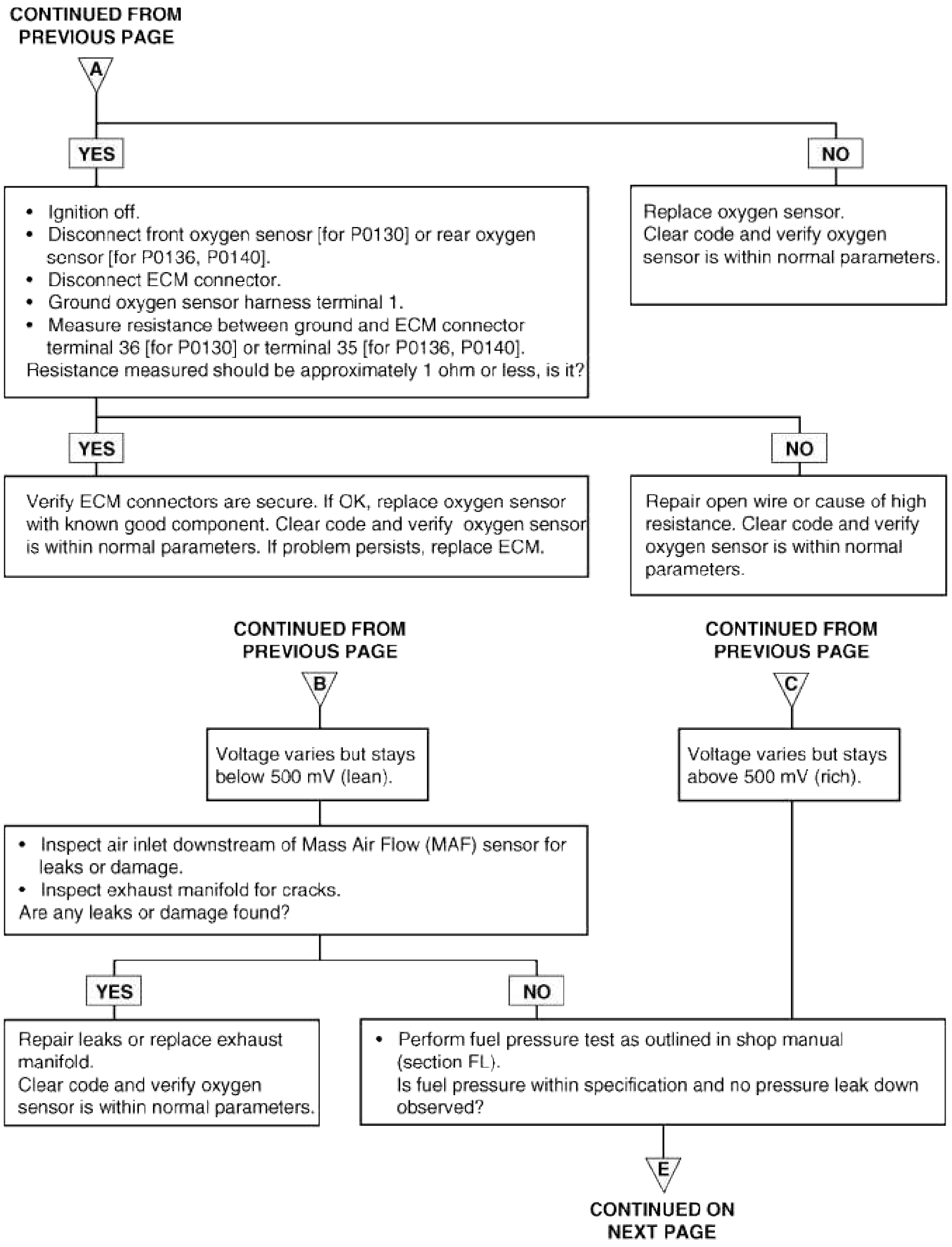
FAILURE CONDITIONS

CIRCUIT DIAGRAM


From Engine Control Relay
4
4
BANK1
SENSOR 2
BANK1
SENSOR 1
3
2
1
3
2
1
28
55
35
48
18
36
Sensor heater
Sensor signal
Sensor ground
Sensor heater
Sensor signal
Sensor ground
ECM
Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE


• Turn Ignition Switch on.
• Connect Scan Tool to Data Link Connector.
• Verify DTC P0130, P0136 or P0140 is set.
Are other DTCs also set?
NO
YES
Repair conditions that caused other DTCs to set. Refer to DTC test procedures.
• Start engine and warm it to normal operating temperature .
• Vary engine speed and, using scan tool, monitor oxygen sensor voltage.
Voltage should vary between 0 and 900 mV, does it?
No, voltage is constant and the reading is approximately 450 mV.
No, voltage is constant and approximately 5 or 12 volts.
No, 0 volts present.
No, voltage varies but stays below 500 mV (lean).
No, voltage varies but stays above 500 mV (rich).
Yes, voltage varies between 0 and 900 mV.
Repair short to voltage in wiring harness. Clear code and verify oxygen sensor is within normal parameters
B
C
D
CONTINUED ON NEXT PAGE
• While running the engine, measure voltage (backprobe) between oxygen sensor connector terminals 1 and 2.
Does voltage vary above and below 500 mV?
• Disconnect oxygen sensor connector.
Does voltage now read approximately 450 mV on scan tool?
NO
YES
For P0130 : Repair short to ground in wire between oxygen sensor harness connector terminal 1 and ECM connector terminal 36.
For P0136 : Repair short to ground in wire between
For P0140 oxygen sensor harness connector terminal 1 and ECM connector terminal 35.
Clear code and verify oxygen sensor is within normal parameters.
Replace oxygen sensor. Clear code and verify oxygen sensor is within normal parameters.
A
CONTINUED ON NEXT PAGE



CONTINUED FROM PREVIOUS PAGE
A
YES
NO

- Ignition off.
- Disconnect front oxygen senosr [for P0130] or rear oxygen sensor [for P0136, P0140].
- Disconnect ECM connector.
- Ground oxygen sensor harness terminal 1.
- Measure resistance between ground and ECM connector terminal 36 [for P0130] or terminal 35 [for P0136, P0140].

Resistance measured should be approximately 1 ohm or less, is it?

Replace oxygen sensor.
Clear code and verify oxygen sensor is within normal parameters.

Verify ECM connectors are secure. If OK, replace oxygen sensor with known good component. Clear code and verify oxygen sensor is within normal parameters. If problem persists, replace ECM.

Repair open wire or cause of high resistance. Clear code and verify oxygen sensor is within normal parameters.

CONTINUED FROM PREVIOUS PAGE
B
CONTINUED FROM PREVIOUS PAGE
C

Voltage varies but stays below 500 mV (lean).

Voltage varies but stays above 500 mV (rich).

- Inspect air inlet downstream of Mass Air Flow (MAF) sensor for leaks or damage.
- Inspect exhaust manifold for cracks.

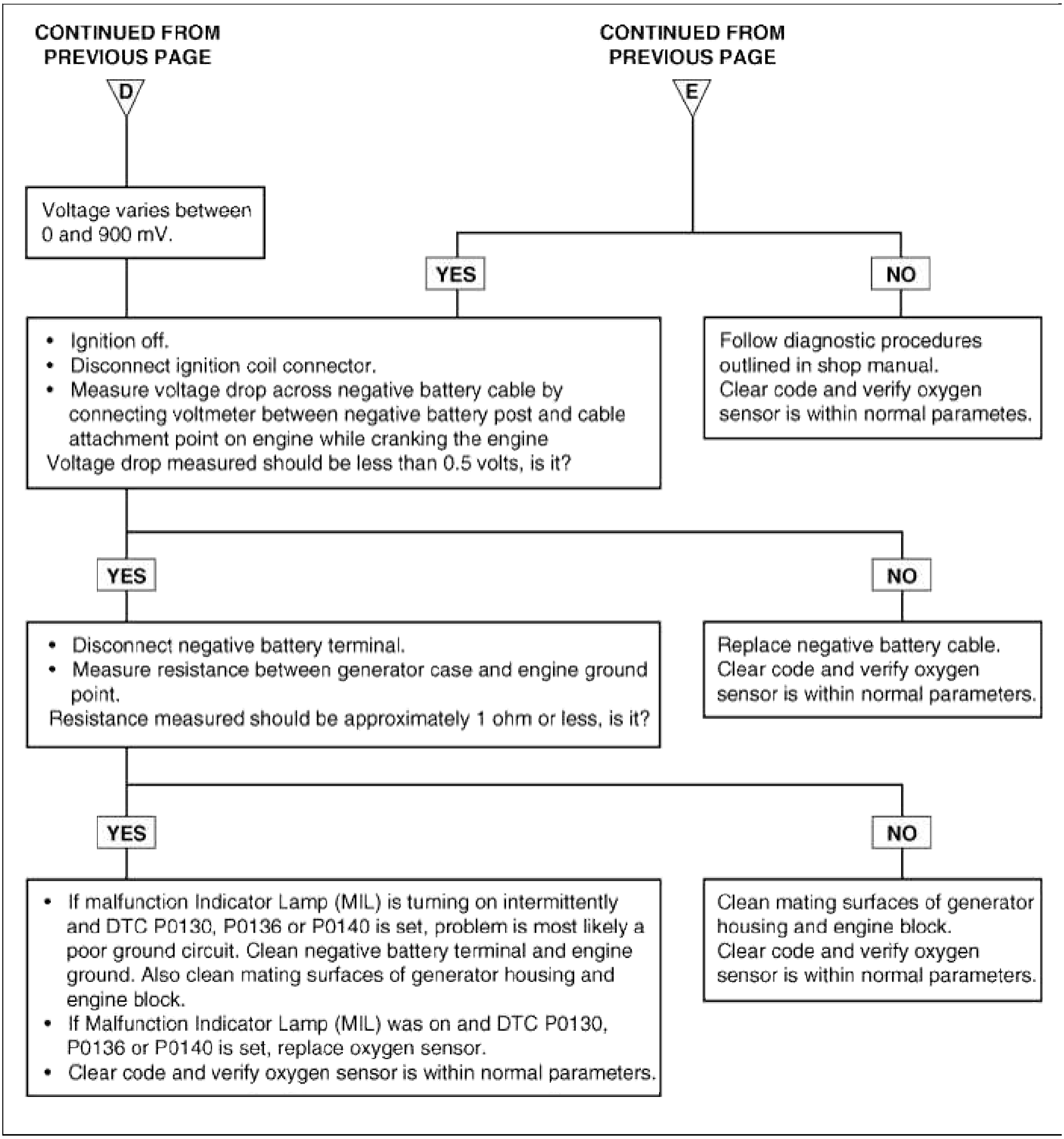
Are any leaks or damage found?

Repair leaks or replace exhaust manifold.
Clear code and verify oxygen sensor is within normal parameters.

- Perform fuel pressure test as outlined in shop manual (section FL).

Is fuel pressure within specification and no pressure leak down observed?

E
CONTINUED ON NEXT PAGE



Voltage varies between 0 and 900 mV.

- Ignition off.
- Disconnect ignition coil connector.
- Measure voltage drop across negative battery cable by connecting voltmeter between negative battery post and cable attachment point on engine while cranking the engine

Voltage drop measured should be less than 0.5 volts, is it?

Follow diagnostic procedures outlined in shop manual.
Clear code and verify oxygen sensor is within normal parametes.

- Disconnect negative battery terminal.
- Measure resistance between generator case and engine ground point.

Resistance measured should be approximately 1 ohm or less, is it?

Replace negative battery cable.
Clear code and verify oxygen sensor is within normal parameters.

- If malfunction Indicator Lamp (MIL) is turning on intermittently and DTC P0130, P0136 or P0140 is set, problem is most likely a poor ground circuit. Clean negative battery terminal and engine ground. Also clean mating surfaces of generator housing and engine block.
- If Malfunction Indicator Lamp (MIL) was on and DTC P0130, P0136 or P0140 is set, replace oxygen sensor.
- Clear code and verify oxygen sensor is within normal parameters.

Clean mating surfaces of generator housing and engine block.
Clear code and verify oxygen sensor is within normal parameters.

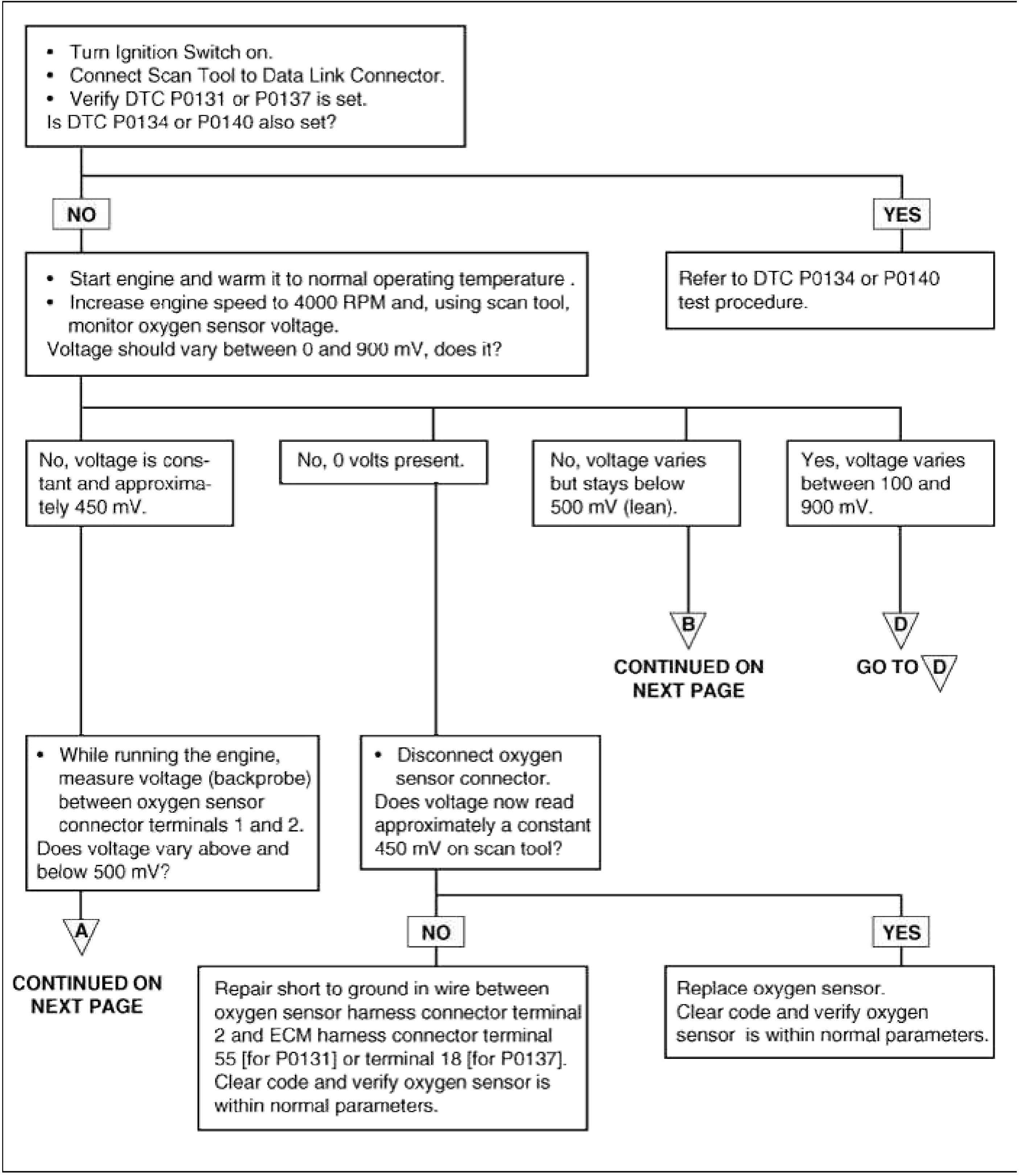
Fuel System > Troubleshooting > P0137

[P0131/P0137]

DTC	Diagnostic item
P0131 P0137	Oxygen Sensor Circuit Low Voltage (Bank 1, Sensor 1) Oxygen Sensor Circuit Low Voltage (Bank 1, Sensor 2)

DESCRIPTION
Refer to DTC P0130& P0136.

FAILURE CONDITIONS
TEST PROCEDURE



- Turn Ignition Switch on.
- Connect Scan Tool to Data Link Connector.
- Verify DTC P0131 or P0137 is set.

Is DTC P0134 or P0140 also set?

Refer to DTC P0134 or P0140 test procedure.

- Start engine and warm it to normal operating temperature .
- Increase engine speed to 4000 RPM and, using scan tool, monitor oxygen sensor voltage.

Voltage should vary between 0 and 900 mV, does it?

No, voltage is constant and approximately 450 mV.

No, 0 volts present.

No, voltage varies but stays below 500 mV (lean).

Yes, voltage varies between 100 and 900 mV.

- While running the engine, measure voltage (backprobe) between oxygen sensor connector terminals 1 and 2.

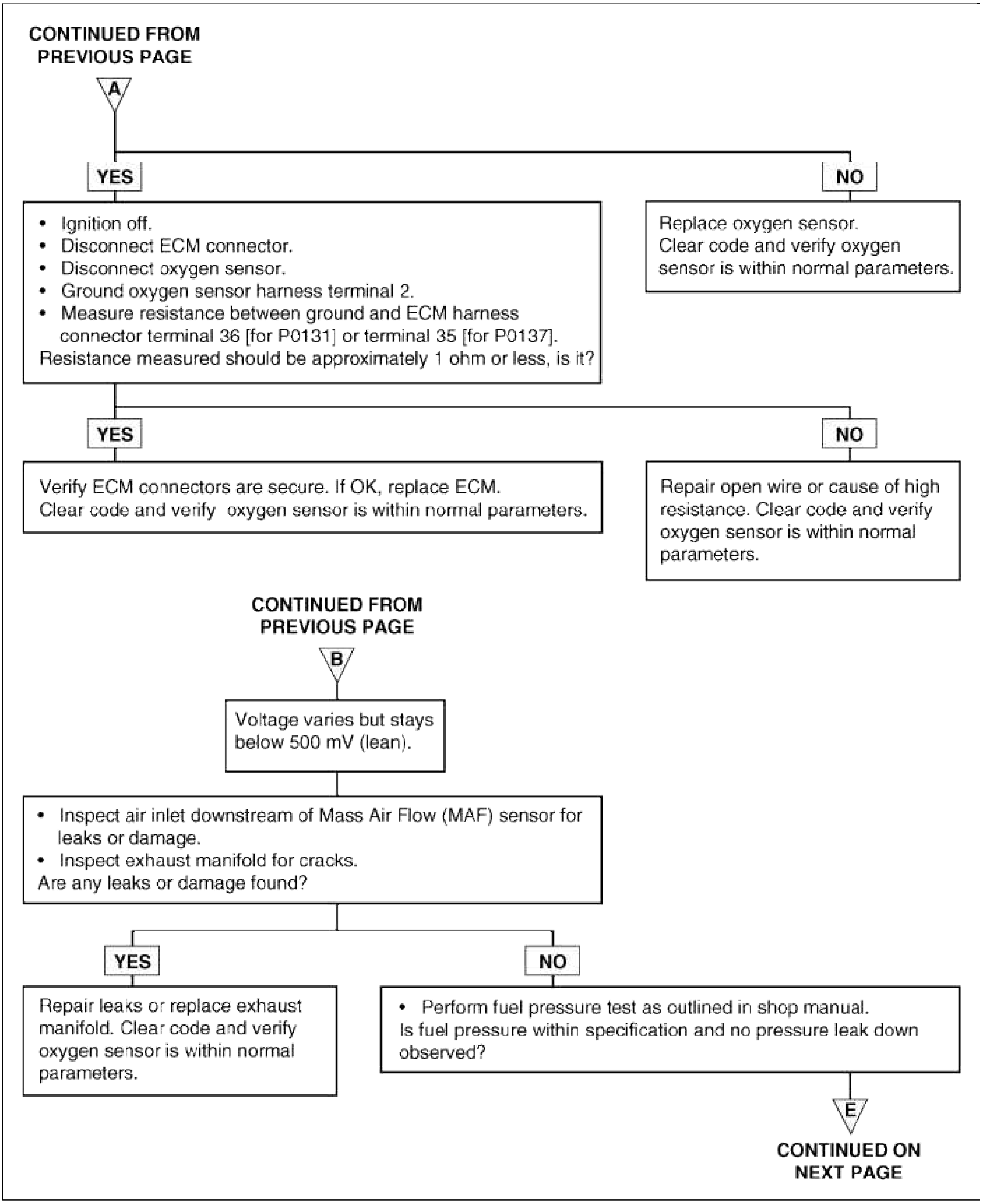
Does voltage vary above and below 500 mV?

- Disconnect oxygen sensor connector.

Does voltage now read approximately a constant 450 mV on scan tool?

Repair short to ground in wire between oxygen sensor harness connector terminal 2 and ECM harness connector terminal 55 [for P0131] or terminal 18 [for P0137]. Clear code and verify oxygen sensor is within normal parameters.

Replace oxygen sensor. Clear code and verify oxygen sensor is within normal parameters.



CONTINUED FROM PREVIOUS PAGE

- Ignition off.
- Disconnect ECM connector.
- Disconnect oxygen sensor.
- Ground oxygen sensor harness terminal 2.
- Measure resistance between ground and ECM harness connector terminal 36 [for P0131] or terminal 35 [for P0137].

Resistance measured should be approximately 1 ohm or less, is it?

Replace oxygen sensor.
Clear code and verify oxygen sensor is within normal parameters.

Verify ECM connectors are secure. If OK, replace ECM.
Clear code and verify oxygen sensor is within normal parameters.

Repair open wire or cause of high resistance. Clear code and verify oxygen sensor is within normal parameters.

CONTINUED FROM PREVIOUS PAGE

Voltage varies but stays below 500 mV (lean).

- Inspect air inlet downstream of Mass Air Flow (MAF) sensor for leaks or damage.
- Inspect exhaust manifold for cracks.

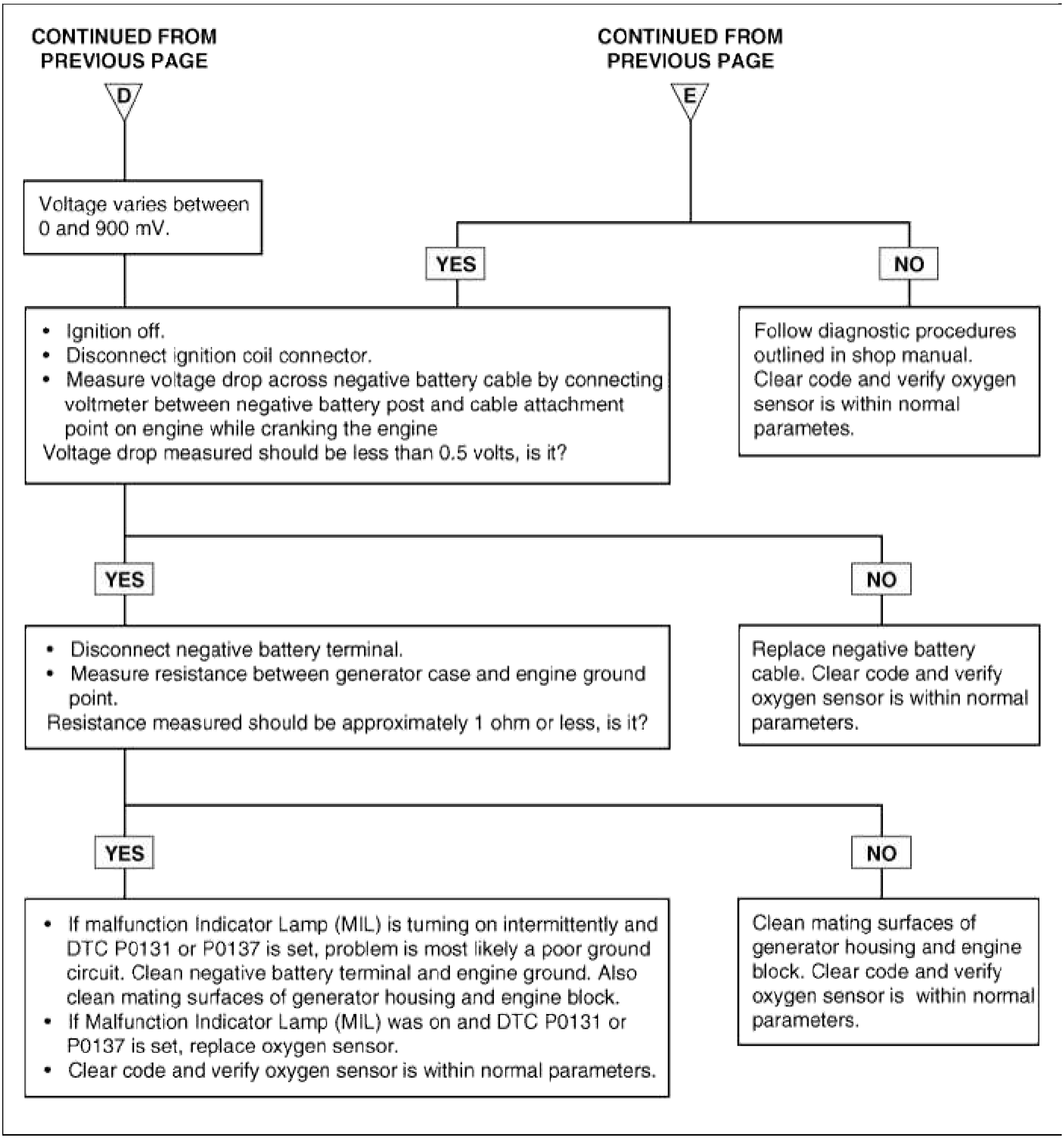
Are any leaks or damage found?

Repair leaks or replace exhaust manifold. Clear code and verify oxygen sensor is within normal parameters.

- Perform fuel pressure test as outlined in shop manual.

Is fuel pressure within specification and no pressure leak down observed?

CONTINUED ON NEXT PAGE



Voltage varies between 0 and 900 mV.

- Ignition off.
- Disconnect ignition coil connector.
- Measure voltage drop across negative battery cable by connecting voltmeter between negative battery post and cable attachment point on engine while cranking the engine

Voltage drop measured should be less than 0.5 volts, is it?

Follow diagnostic procedures outlined in shop manual. Clear code and verify oxygen sensor is within normal parametes.

- Disconnect negative battery terminal.
- Measure resistance between generator case and engine ground point.

Resistance measured should be approximately 1 ohm or less, is it?

Replace negative battery cable. Clear code and verify oxygen sensor is within normal parameters.

- If malfunction Indicator Lamp (MIL) is turning on intermittently and DTC P0131 or P0137 is set, problem is most likely a poor ground circuit. Clean negative battery terminal and engine ground. Also clean mating surfaces of generator housing and engine block.
- If Malfunction Indicator Lamp (MIL) was on and DTC P0131 or P0137 is set, replace oxygen sensor.
- Clear code and verify oxygen sensor is within normal parameters.

Clean mating surfaces of generator housing and engine block. Clear code and verify oxygen sensor is within normal parameters.

Fuel System > Troubleshooting > P0138

[P0132/P0138]

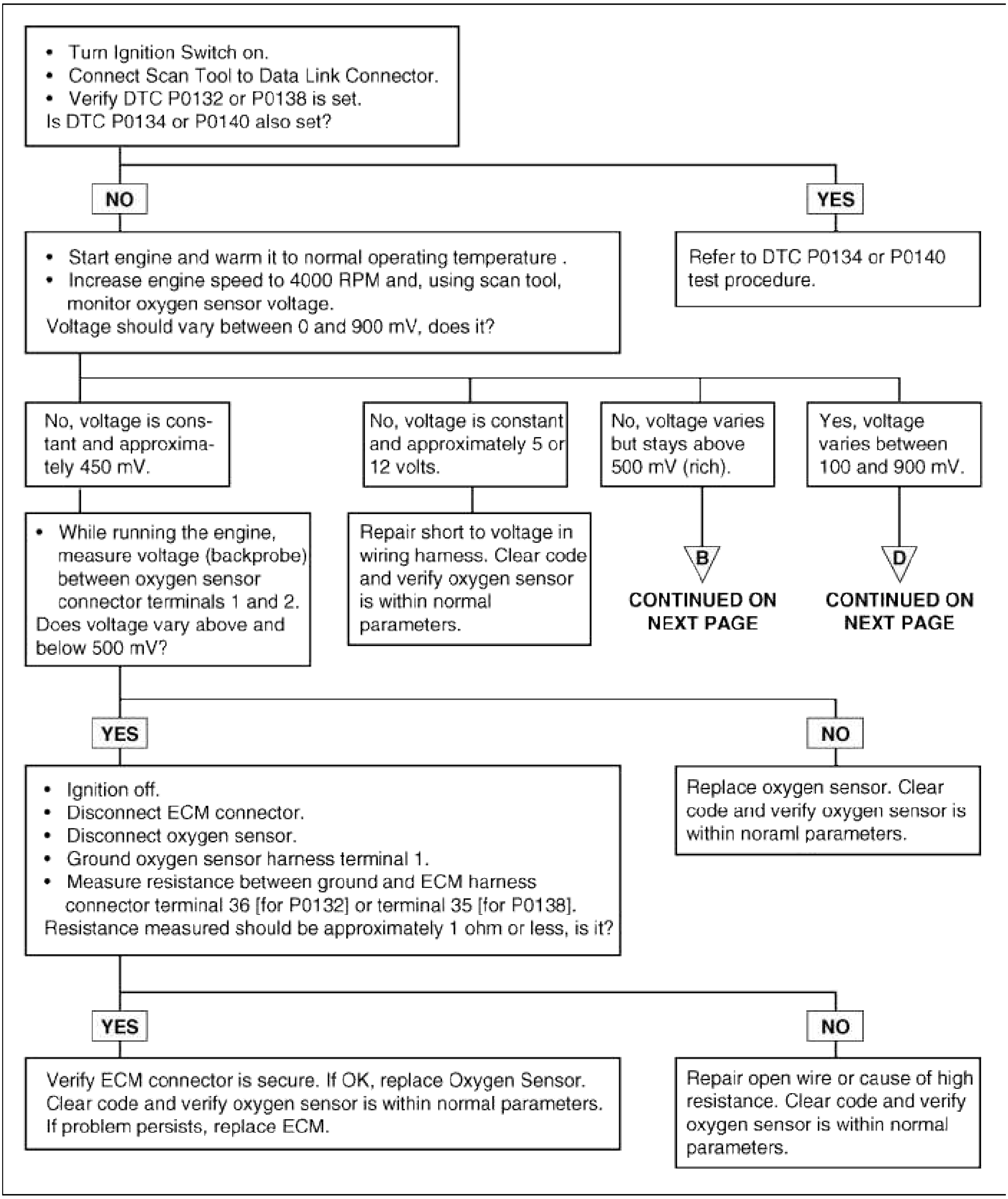
DTC	Diagnostic item
P0132 P0138	Oxygen Sensor Circuit High Voltage (Bank 1, Sensor 1) Oxygen Sensor Circuit High Voltage (Bank 1, Sensor 2)

DESCRIPTION

Refer to DTC P0130& P0136.

FAILURE CONDITIONS

TEST PROCEDURE



- Turn Ignition Switch on.
- Connect Scan Tool to Data Link Connector.
- Verify DTC P0132 or P0138 is set.

Is DTC P0134 or P0140 also set?

NO

- Start engine and warm it to normal operating temperature .
- Increase engine speed to 4000 RPM and, using scan tool, monitor oxygen sensor voltage.

Voltage should vary between 0 and 900 mV, does it?

YES

Refer to DTC P0134 or P0140 test procedure.

No, voltage is constant and approximately 450 mV.

- While running the engine, measure voltage (backprobe) between oxygen sensor connector terminals 1 and 2.

Does voltage vary above and below 500 mV?

No, voltage is constant and approximately 5 or 12 volts.

Repair short to voltage in wiring harness. Clear code and verify oxygen sensor is within normal parameters.

No, voltage varies but stays above 500 mV (rich).

CONTINUED ON NEXT PAGE

Yes, voltage varies between 100 and 900 mV.

CONTINUED ON NEXT PAGE

YES

- Ignition off.
- Disconnect ECM connector.
- Disconnect oxygen sensor.
- Ground oxygen sensor harness terminal 1.
- Measure resistance between ground and ECM harness connector terminal 36 [for P0132] or terminal 35 [for P0138].

Resistance measured should be approximately 1 ohm or less, is it?

NO

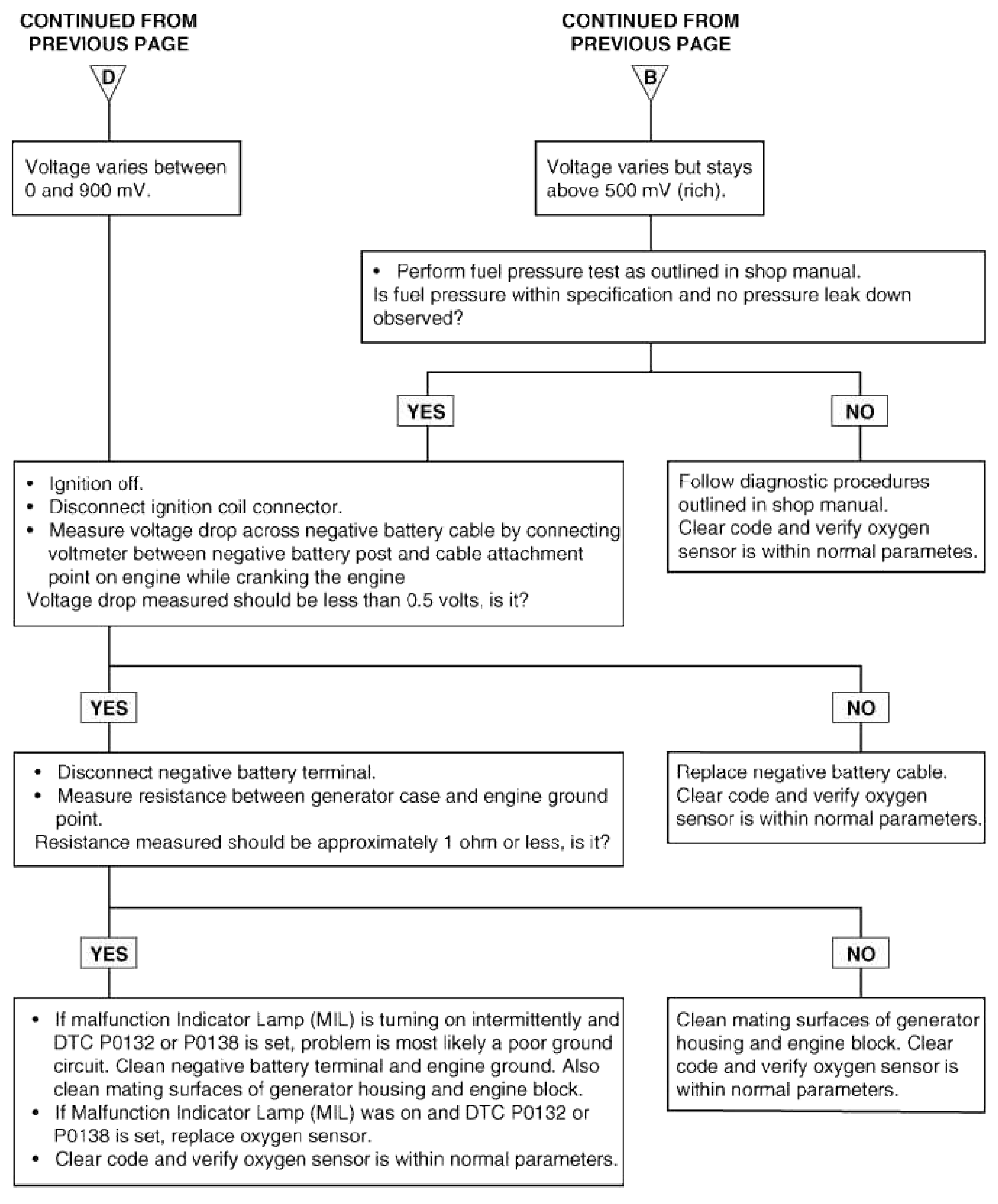
Replace oxygen sensor. Clear code and verify oxygen sensor is within noraml parameters.

YES

Verify ECM connector is secure. If OK, replace Oxygen Sensor. Clear code and verify oxygen sensor is within normal parameters. If problem persists, replace ECM.

NO

Repair open wire or cause of high resistance. Clear code and verify oxygen sensor is within normal parameters.


CONTINUED FROM PREVIOUS PAGE
D
CONTINUED FROM PREVIOUS PAGE
B
Voltage varies between 0 and 900 mV.
Voltage varies but stays above 500 mV (rich).
• Perform fuel pressure test as outlined in shop manual. Is fuel pressure within specification and no pressure leak down observed?
YES
NO
• Ignition off. • Disconnect ignition coil connector. • Measure voltage drop across negative battery cable by connecting voltmeter between negative battery post and cable attachment point on engine while cranking the engine Voltage drop measured should be less than 0.5 volts, is it?
Follow diagnostic procedures outlined in shop manual. Clear code and verify oxygen sensor is within normal parametes.
YES
NO
• Disconnect negative battery terminal. • Measure resistance between generator case and engine ground point. Resistance measured should be approximately 1 ohm or less, is it?
Replace negative battery cable. Clear code and verify oxygen sensor is within normal parameters.
YES
NO
• If malfunction Indicator Lamp (MIL) is turning on intermittently and DTC P0132 or P0138 is set, problem is most likely a poor ground circuit. Clean negative battery terminal and engine ground. Also clean mating surfaces of generator housing and engine block. • If Malfunction Indicator Lamp (MIL) was on and DTC P0132 or P0138 is set, replace oxygen sensor. • Clear code and verify oxygen sensor is within normal parameters.
Clean mating surfaces of generator housing and engine block. Clear code and verify oxygen sensor is within normal parameters.

Fuel System > Troubleshooting > P0140

[P0130/P0136/P0140]

DTC	Diagnostic item
P0130 P0136 P0140	Oxygen Sensor Circuit Malfunction (Bank 1, Sensor 1) Oxygen Sensor Circuit Malfunction (Bank 1, Sensor 2) Oxygen Sensor Circuit No Activity (Bank 1, Sensor 2)

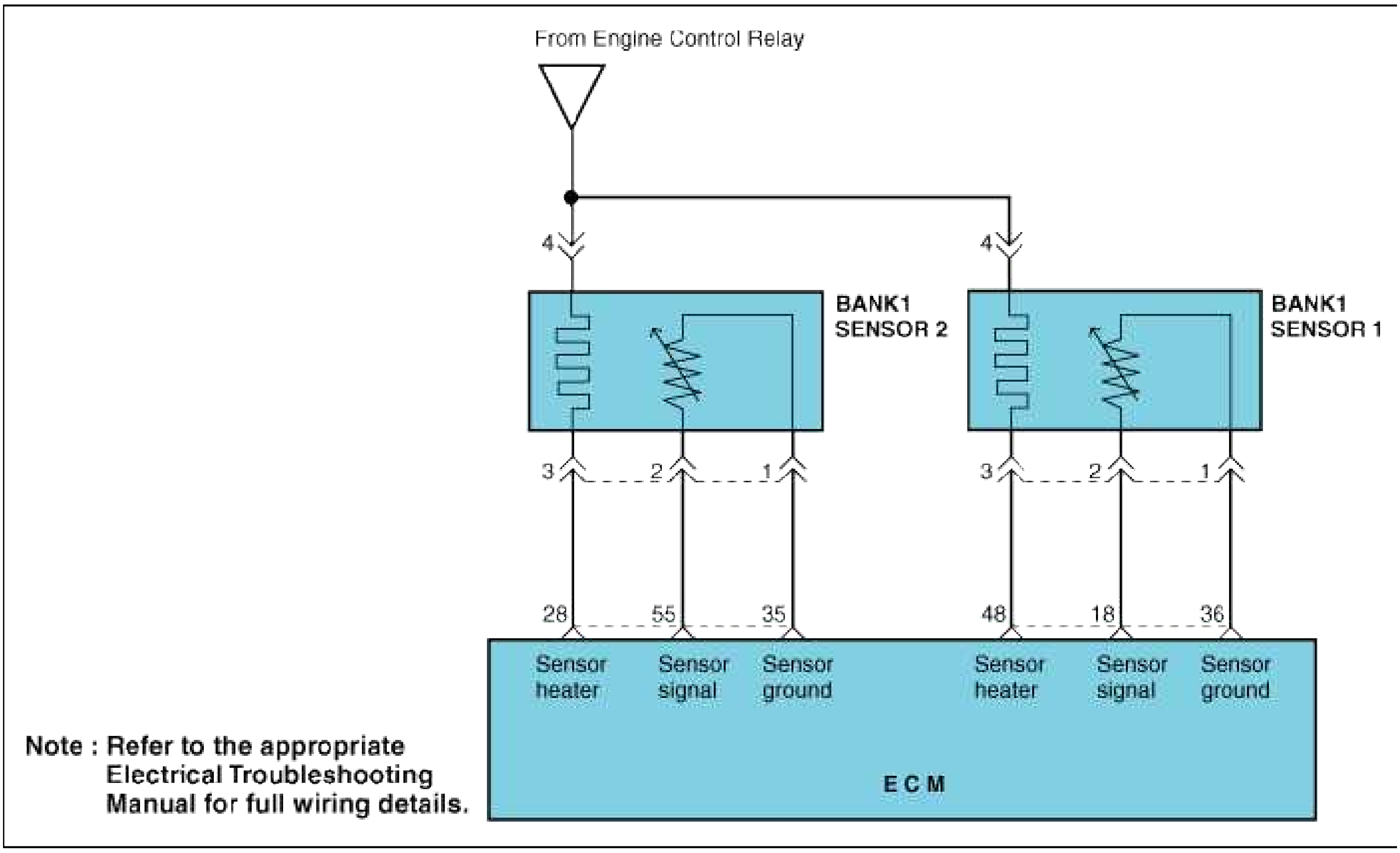
DESCRIPTION

The Engine Control Module (ECM) uses oxygen sensor signals to maintain the air fuel mixture at the ratio resulting in optimum fuel economy and reduced emissions. The amount of oxygen in the exhaust gases indicates, to the front oxygen sensor, whether the air fuel mixture being supplied to the engine cylinders is rich or lean. The readings of the rear oxygen sensor are used to indicate the efficiency of the catalytic converter. The ECM calculates catalytic converter efficiency by comparing the rear oxygen sensor signal to the front oxygen sensor signal.

A normal oxygen sensor signal will constantly fluctuate above and below 500 mV, with the front oxygen sensor signal frequency of at least 5Hz at 2500 RPM. Due to the effect of the catalytic converter, the rear oxygen sensor signal frequency will be lower than the front oxygen sensor signal frequency. If the rear oxygen sensor signal coincides with the front oxygen sensor signal a large percentage of the time, this indicates a loss in efficiency of the catalytic converter or a malfunction within the fuel system.

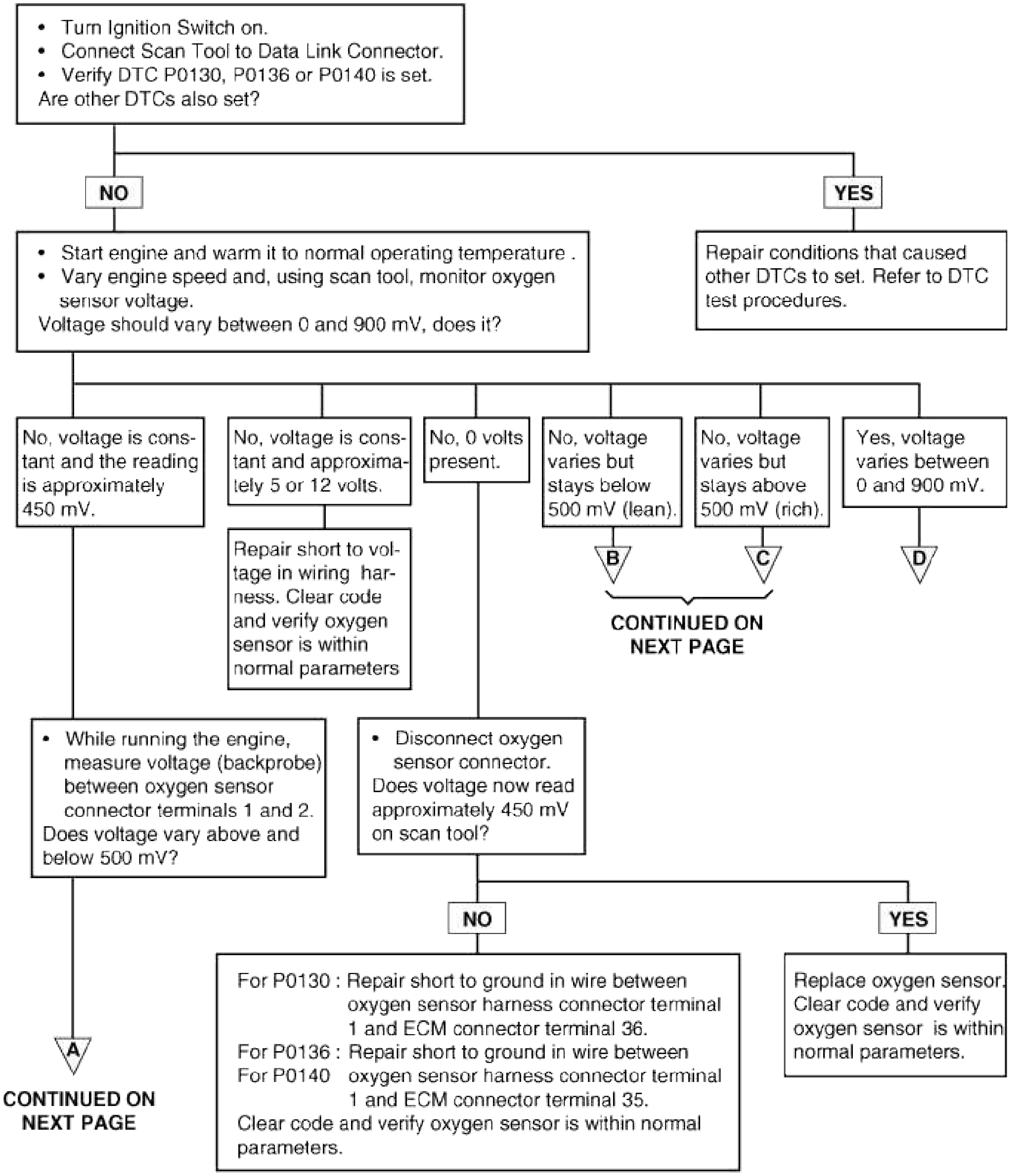
FAILURE CONDITIONS

CIRCUIT DIAGRAM


From Engine Control Relay
4
4
BANK1
SENSOR 2
BANK1
SENSOR 1
3
2
1
3
2
1
28
55
35
48
18
36
Sensor heater
Sensor signal
Sensor ground
Sensor heater
Sensor signal
Sensor ground
ECM

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn Ignition Switch on.
- Connect Scan Tool to Data Link Connector.
- Verify DTC P0130, P0136 or P0140 is set.

Are other DTCs also set?

- Start engine and warm it to normal operating temperature .
- Vary engine speed and, using scan tool, monitor oxygen sensor voltage.

Voltage should vary between 0 and 900 mV, does it?

Repair conditions that caused other DTCs to set. Refer to DTC test procedures.

No, voltage is constant and the reading is approximately 450 mV.

No, voltage is constant and approximately 5 or 12 volts.

No, 0 volts present.

No, voltage varies but stays below 500 mV (lean).

No, voltage varies but stays above 500 mV (rich).

Yes, voltage varies between 0 and 900 mV.

Repair short to voltage in wiring harness. Clear code and verify oxygen sensor is within normal parameters

CONTINUED ON NEXT PAGE

- While running the engine, measure voltage (backprobe) between oxygen sensor connector terminals 1 and 2.

Does voltage vary above and below 500 mV?

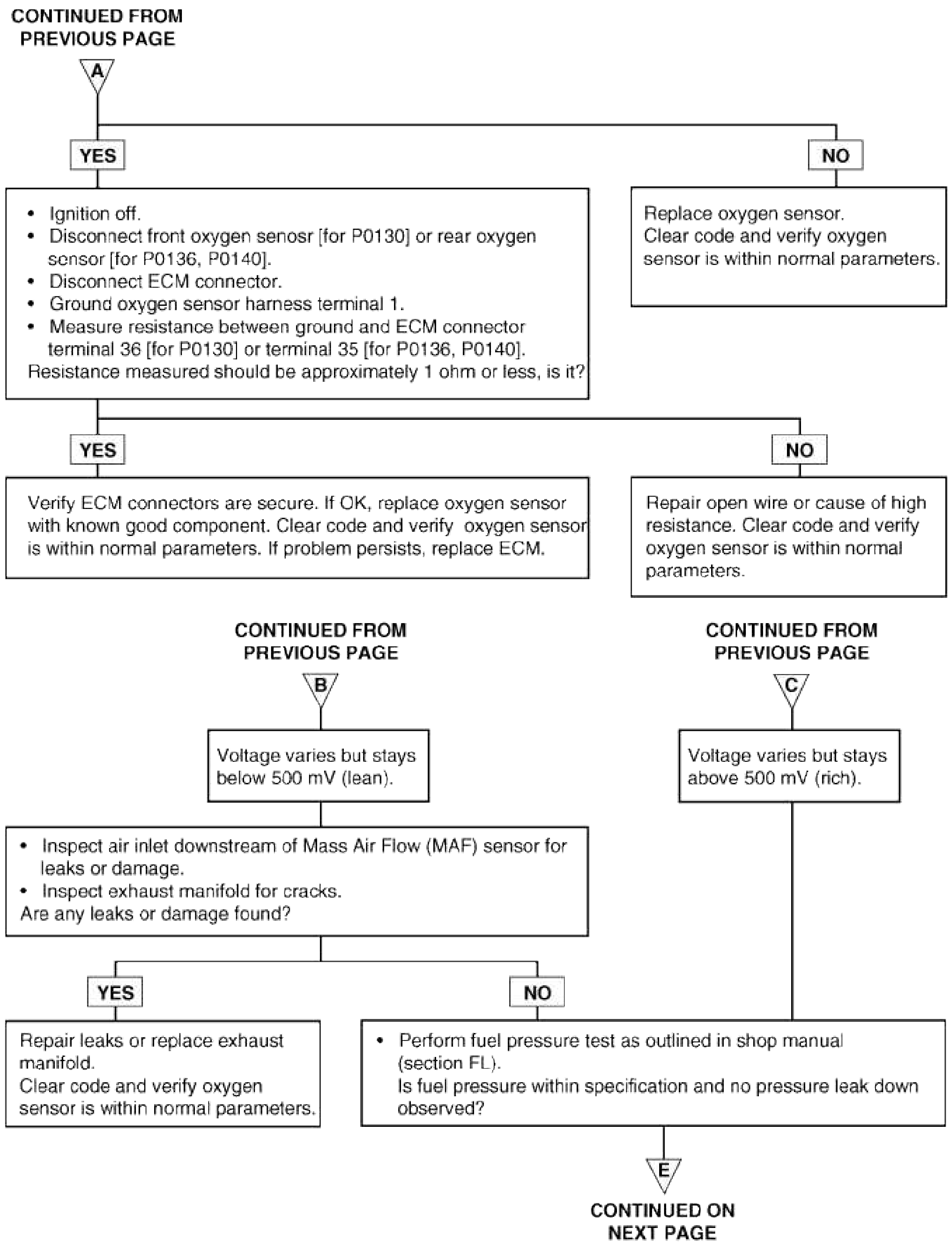
- Disconnect oxygen sensor connector.

Does voltage now read approximately 450 mV on scan tool?

For P0130 : Repair short to ground in wire between oxygen sensor harness connector terminal 1 and ECM connector terminal 36.
For P0136 : Repair short to ground in wire between
For P0140 oxygen sensor harness connector terminal 1 and ECM connector terminal 35.
Clear code and verify oxygen sensor is within normal parameters.

Replace oxygen sensor. Clear code and verify oxygen sensor is within normal parameters.

CONTINUED ON NEXT PAGE



CONTINUED FROM PREVIOUS PAGE

- Ignition off.
- Disconnect front oxygen senosr [for P0130] or rear oxygen sensor [for P0136, P0140].
- Disconnect ECM connector.
- Ground oxygen sensor harness terminal 1.
- Measure resistance between ground and ECM connector terminal 36 [for P0130] or terminal 35 [for P0136, P0140].

Resistance measured should be approximately 1 ohm or less, is it?

Replace oxygen sensor.
Clear code and verify oxygen sensor is within normal parameters.

Verify ECM connectors are secure. If OK, replace oxygen sensor with known good component. Clear code and verify oxygen sensor is within normal parameters. If problem persists, replace ECM.

Repair open wire or cause of high resistance. Clear code and verify oxygen sensor is within normal parameters.

CONTINUED FROM PREVIOUS PAGE

Voltage varies but stays below 500 mV (lean).

CONTINUED FROM PREVIOUS PAGE

Voltage varies but stays above 500 mV (rich).

- Inspect air inlet downstream of Mass Air Flow (MAF) sensor for leaks or damage.
- Inspect exhaust manifold for cracks.

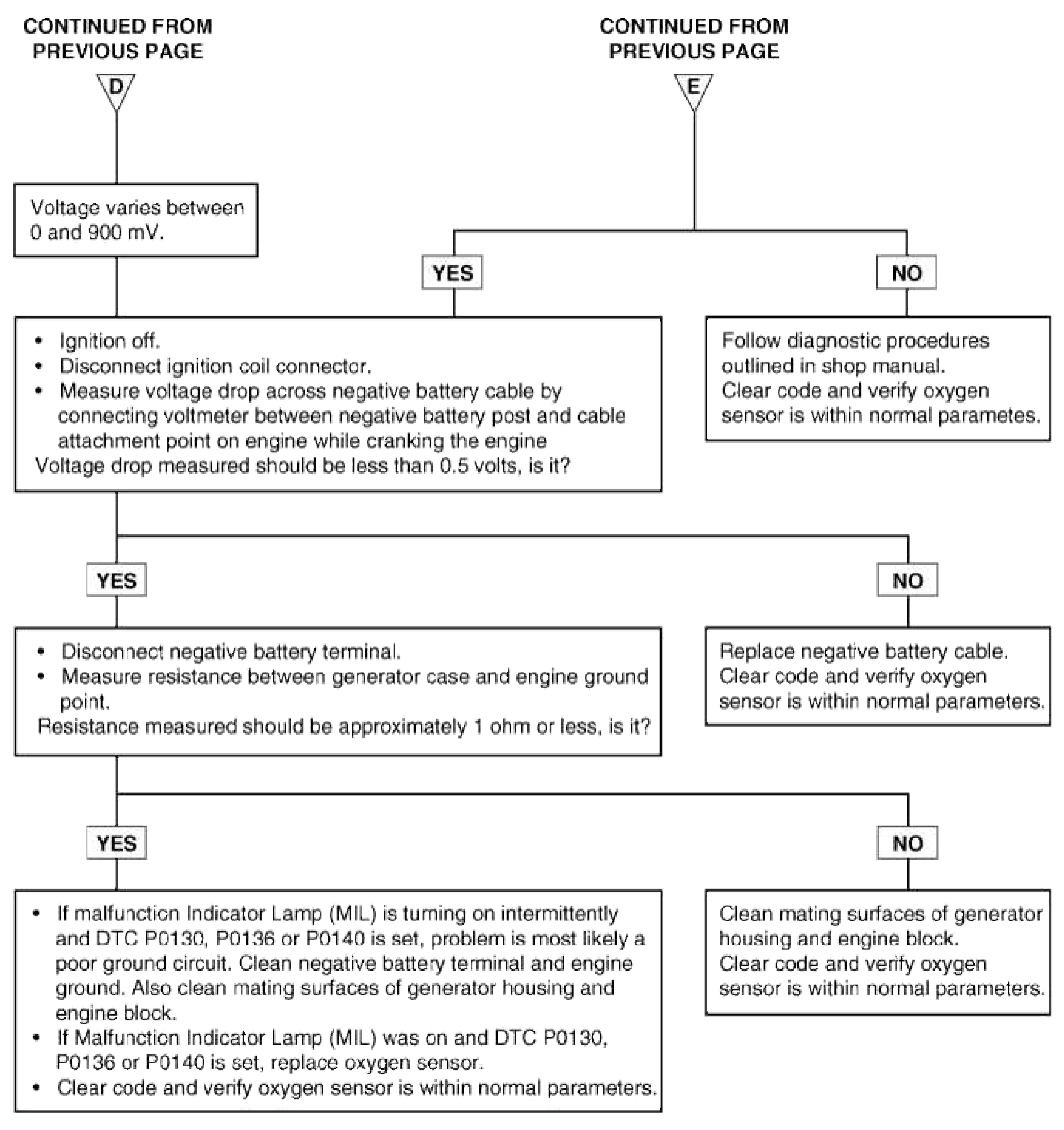
Are any leaks or damage found?

Repair leaks or replace exhaust manifold.
Clear code and verify oxygen sensor is within normal parameters.

- Perform fuel pressure test as outlined in shop manual (section FL).

Is fuel pressure within specification and no pressure leak down observed?

CONTINUED ON NEXT PAGE



Voltage varies between 0 and 900 mV.

- Ignition off.
- Disconnect ignition coil connector.
- Measure voltage drop across negative battery cable by connecting voltmeter between negative battery post and cable attachment point on engine while cranking the engine

Voltage drop measured should be less than 0.5 volts, is it?

Follow diagnostic procedures outlined in shop manual. Clear code and verify oxygen sensor is within normal parametes.

- Disconnect negative battery terminal.
- Measure resistance between generator case and engine ground point.

Resistance measured should be approximately 1 ohm or less, is it?

Replace negative battery cable. Clear code and verify oxygen sensor is within normal parameters.

- If malfunction Indicator Lamp (MIL) is turning on intermittently and DTC P0130, P0136 or P0140 is set, problem is most likely a poor ground circuit. Clean negative battery terminal and engine ground. Also clean mating surfaces of generator housing and engine block.
- If Malfunction Indicator Lamp (MIL) was on and DTC P0130, P0136 or P0140 is set, replace oxygen sensor.
- Clear code and verify oxygen sensor is within normal parameters.

Clean mating surfaces of generator housing and engine block. Clear code and verify oxygen sensor is within normal parameters.

Fuel System > Troubleshooting > P0171

[P0171/P0172]

DTC	Diagnostic item
P0171 P0172	Fuel Trim Malfunction - System Too Lean (Bank 1) Fuel Trim Malfunction - System Too Rich (Bank 2)

DESCRIPTION

- Intake air system.

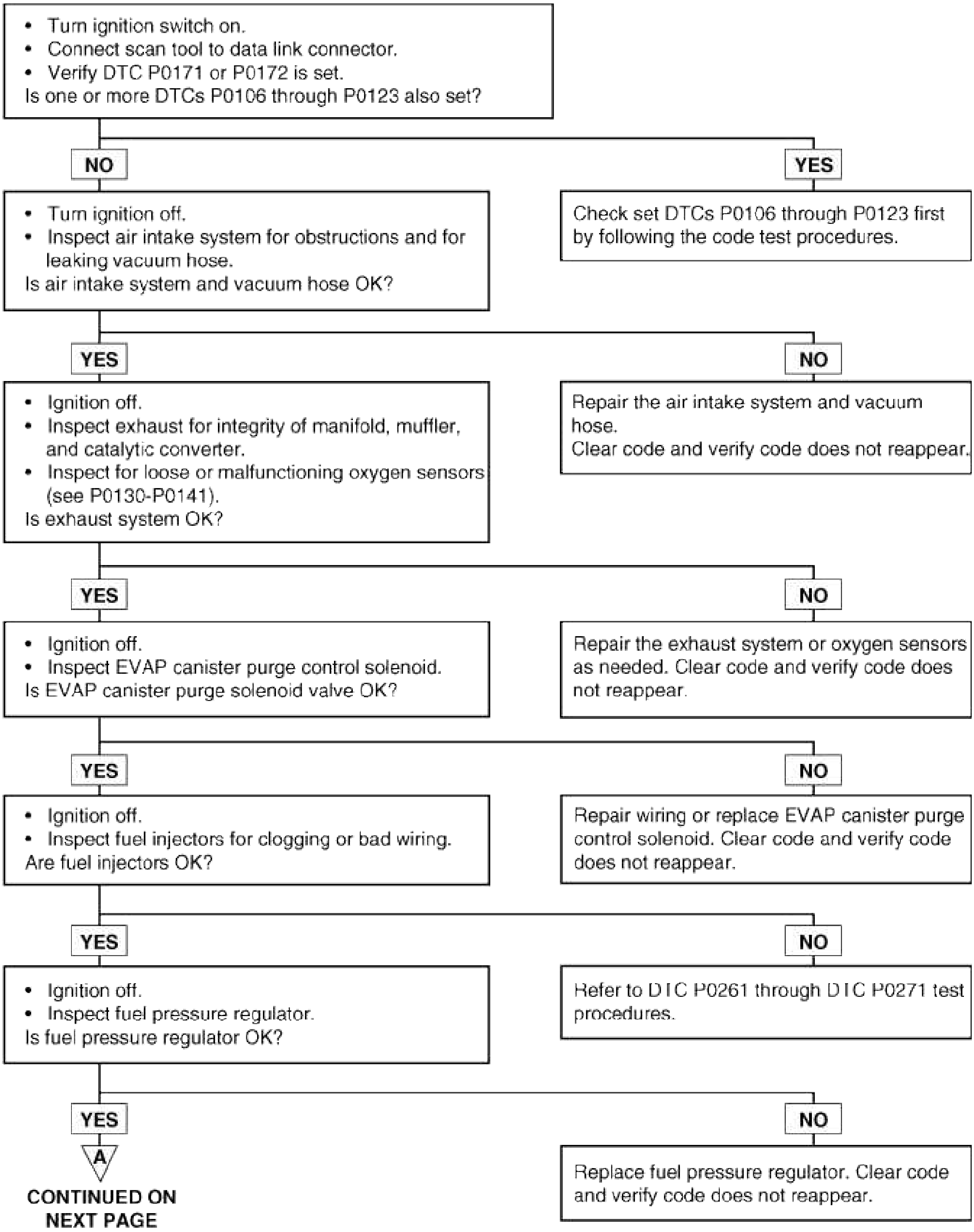
- Exhaust system.
- Evaporative emissions control system (includes purge control solenoid valve).
- Fuel injectors.
- Fuel pressure regulator.
- Fuel pump.

FAILURE CONDITIONS

1. ECM is in closed loop operation.
2. Engine speed is below 1000 RPM.
3. Engine coolant temperature is above 158°F (70°C).
4. Canister purge system is not operating.
5. Mass air flow is less than 7.5 g/s [for P0172] or 5.5 g/s [for P0171].

1. Engine load exceeds 1.8 milliseconds.
2. ECM is in closed loop operation.
3. Engine coolant temperature is above 158°F (70°C).
4. Canister purge system is not operating.
5. Mass air flow is less than or 5.5 g/s.
6. Engine speed is below 1000 RPM.

TEST PROCEDURE



- Turn ignition switch on.
- Connect scan tool to data link connector.
- Verify DTC P0171 or P0172 is set.

Is one or more DTCs P0106 through P0123 also set?

Check set DTCs P0106 through P0123 first by following the code test procedures.

- Turn ignition off.
- Inspect air intake system for obstructions and for leaking vacuum hose.

Is air intake system and vacuum hose OK?

Repair the air intake system and vacuum hose.
Clear code and verify code does not reappear.

- Ignition off.
- Inspect exhaust for integrity of manifold, muffler, and catalytic converter.
- Inspect for loose or malfunctioning oxygen sensors (see P0130-P0141).

Is exhaust system OK?

Repair the exhaust system or oxygen sensors as needed. Clear code and verify code does not reappear.

- Ignition off.
- Inspect EVAP canister purge control solenoid.

Is EVAP canister purge solenoid valve OK?

Repair wiring or replace EVAP canister purge control solenoid. Clear code and verify code does not reappear.

- Ignition off.
- Inspect fuel injectors for clogging or bad wiring.

Are fuel injectors OK?

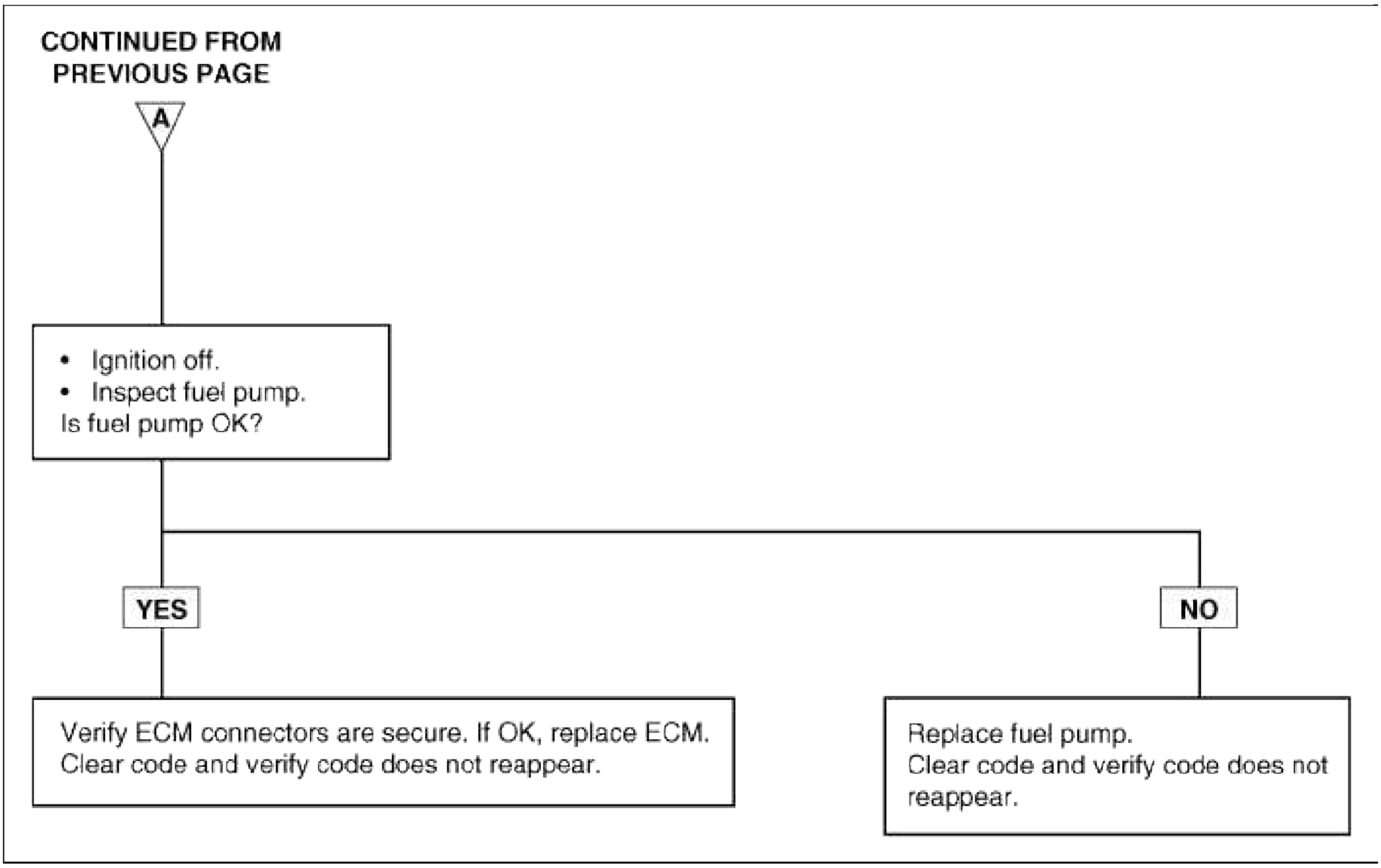
Refer to DTC P0261 through DTC P0271 test procedures.

- Ignition off.
- Inspect fuel pressure regulator.

Is fuel pressure regulator OK?

Replace fuel pressure regulator. Clear code and verify code does not reappear.

CONTINUED ON
NEXT PAGE


CONTINUED FROM PREVIOUS PAGE
A
• Ignition off.
• Inspect fuel pump.
Is fuel pump OK?
YES
NO
Verify ECM connectors are secure. If OK, replace ECM. Clear code and verify code does not reappear.
Replace fuel pump. Clear code and verify code does not reappear.

Fuel System > Troubleshooting > P0172

[P0171/P0172]

DTC	Diagnostic item
P0171 P0172	Fuel Trim Malfunction - System Too Lean (Bank 1) Fuel Trim Malfunction - System Too Rich (Bank 2)

DESCRIPTION

- Intake air system.
- Exhaust system.
- Evaporative emissions control system (includes purge control solenoid valve).
- Fuel injectors.
- Fuel pressure regulator.
- Fuel pump.

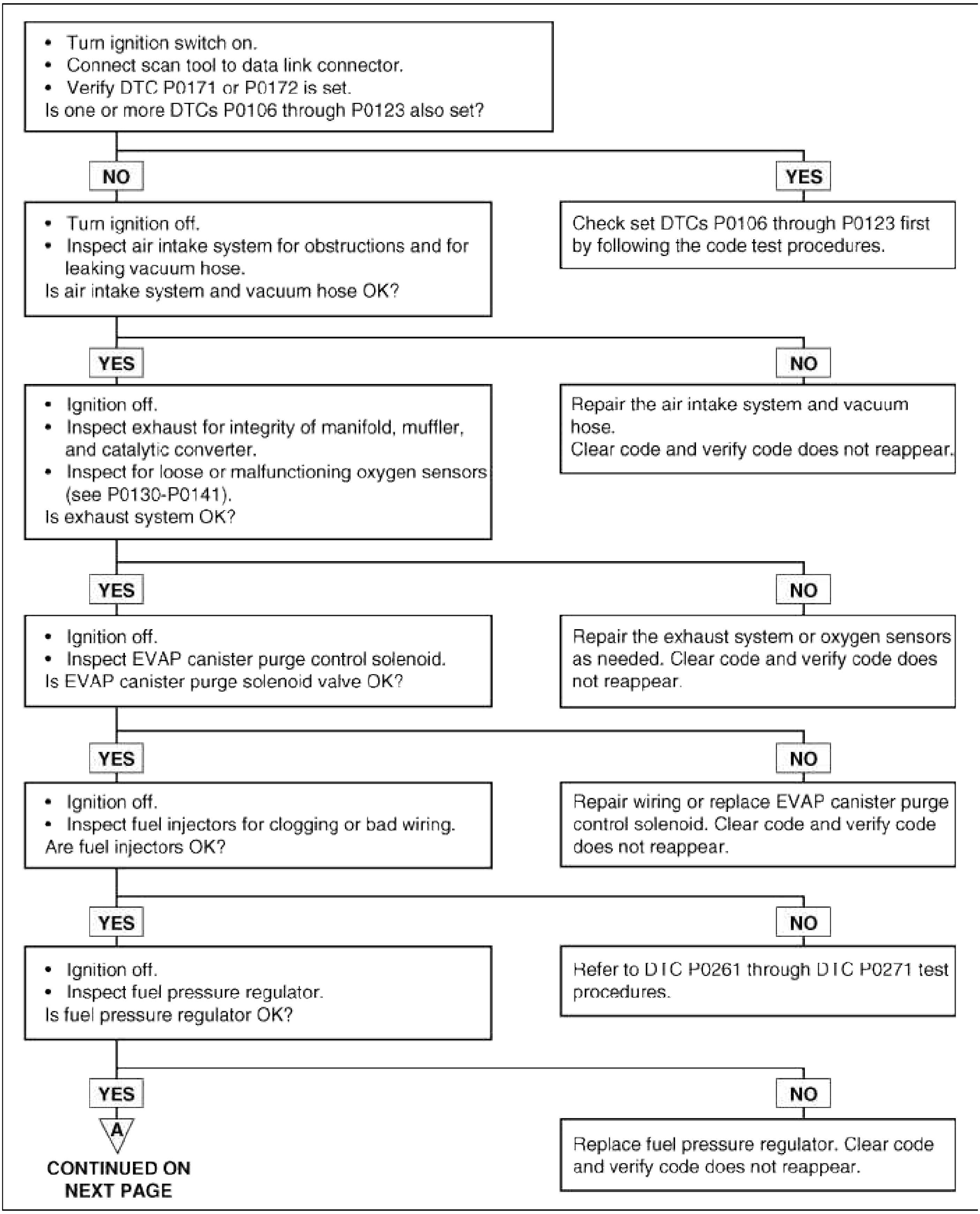
FAILURE CONDITIONS

1. ECM is in closed loop operation.
2. Engine speed is below 1000 RPM.
3. Engine coolant temperature is above 158°F (70°C).
4. Canister purge system is not operating.
5. Mass air flow is less than 7.5 g/s [for P0172] or 5.5 g/s [for P0171].

1. Engine load exceeds 1.8 milliseconds.
2. ECM is in closed loop operation.
3. Engine coolant temperature is above 158°F (70°C).

4. Canister purge system is not operating.
5. Mass air flow is less than or 5.5 g/s.
6. Engine speed is below 1000 RPM.

TEST PROCEDURE



- Turn ignition switch on.
- Connect scan tool to data link connector.
- Verify DTC P0171 or P0172 is set.

Is one or more DTCs P0106 through P0123 also set?

Check set DTCs P0106 through P0123 first by following the code test procedures.

- Turn ignition off.
- Inspect air intake system for obstructions and for leaking vacuum hose.

Is air intake system and vacuum hose OK?

Repair the air intake system and vacuum hose.
Clear code and verify code does not reappear.

- Ignition off.
- Inspect exhaust for integrity of manifold, muffler, and catalytic converter.
- Inspect for loose or malfunctioning oxygen sensors (see P0130-P0141).

Is exhaust system OK?

Repair the exhaust system or oxygen sensors as needed. Clear code and verify code does not reappear.

- Ignition off.
- Inspect EVAP canister purge control solenoid.

Is EVAP canister purge solenoid valve OK?

Repair wiring or replace EVAP canister purge control solenoid. Clear code and verify code does not reappear.

- Ignition off.
- Inspect fuel injectors for clogging or bad wiring.

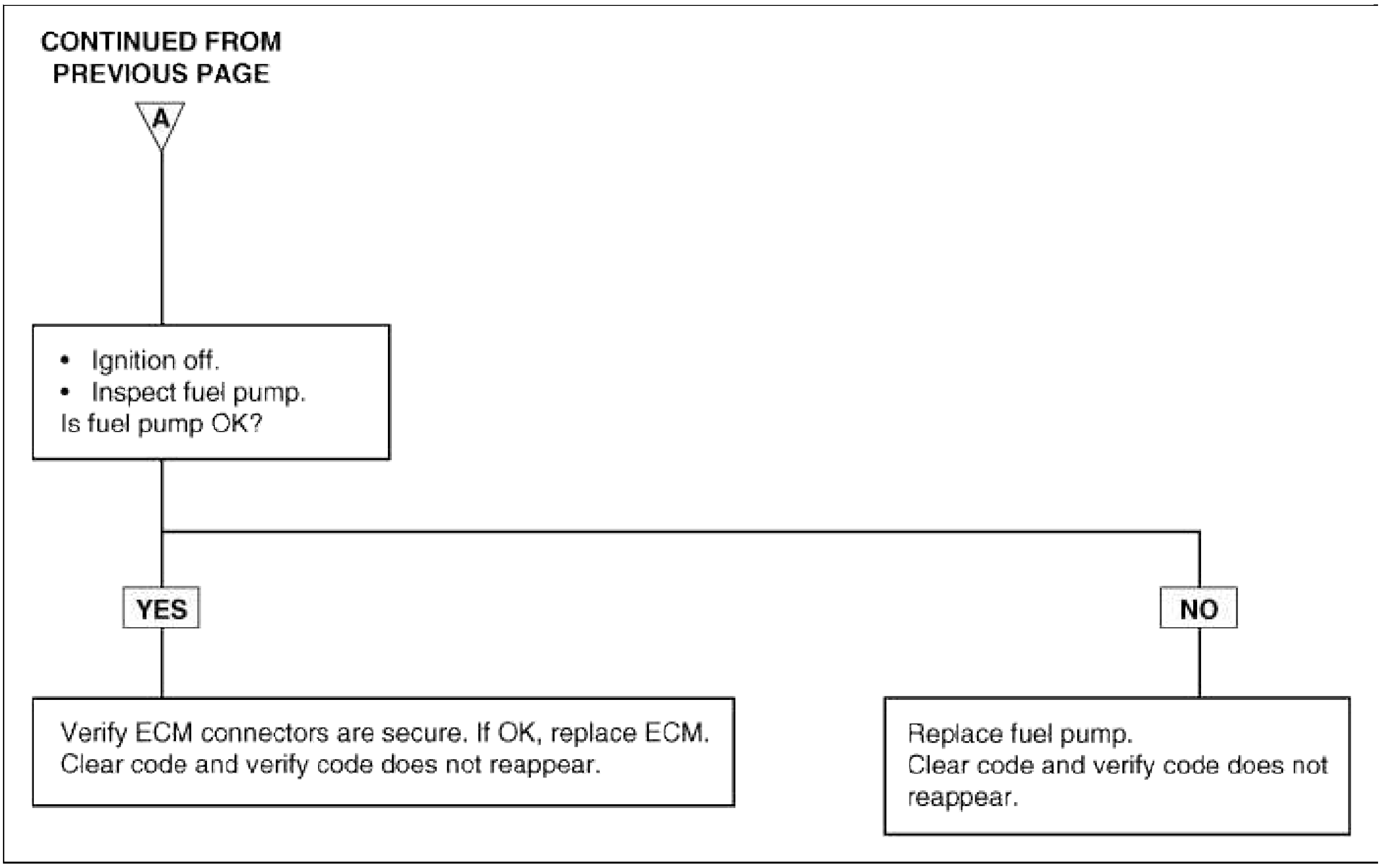
Are fuel injectors OK?

Refer to DTC P0261 through DTC P0271 test procedures.

- Ignition off.
- Inspect fuel pressure regulator.

Is fuel pressure regulator OK?

Replace fuel pressure regulator. Clear code and verify code does not reappear.



- Ignition off.
- Inspect fuel pump.

Is fuel pump OK?

Verify ECM connectors are secure. If OK, replace ECM. Clear code and verify code does not reappear.

Replace fuel pump. Clear code and verify code does not reappear.

Fuel System > Troubleshooting > P0261

[P0261/P0262/P0264/P0265/P0267/P0268/P0270/P0271]

DTC	Diagnostic item
P0261	Injector Circuit Low Input - Cylinder 1
P0262	Injector Circuit High Input - Cylinder 1
P0264	Injector Circuit Low Input - Cylinder 2
P0265	Injector Circuit High Input - Cylinder 2
P0267	Injector Circuit Low Input - Cylinder 3
P0268	Injector Circuit High Input - Cylinder 3
P0270	Injector Circuit Low Input - Cylinder 4
P0271	Injector Circuit High Input - Cylinder 4

DESCRIPTION

The fuel injectors are solenoid operated valves. When a fuel injector solenoid is energized (pulsed) the injector needle valve opens, allowing pressurized fuel to pass through the injector and mix with air entering the engine.

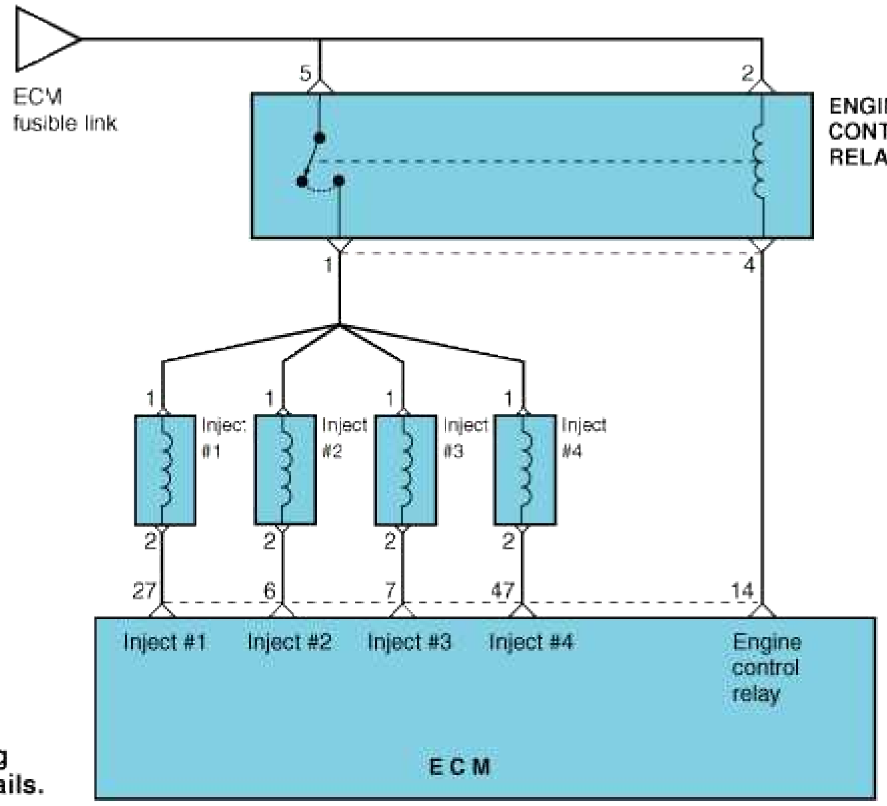
The Engine Control Module (ECM) controls injector timing and pulse width. The ECM pulses the fuel injectors based on information provided by its network of engine sensors. The ECM uses the crankshaft position sensor to determine when to pulse the injectors. Engine coolant temperature, intake air temperature, air flow, and throttle position data are all used by the ECM to calculate injector pulse width.

The ECM also uses its network of sensors to determine whether all injectors should be pulsed at the same time (simultaneous injection) or each injector should be pulsed individually (sequential injection). Sequential injection is almost always used during normal engine operation. Simultaneous injection may be used when the engine is being cranked.

FAILURE CONDITIONS

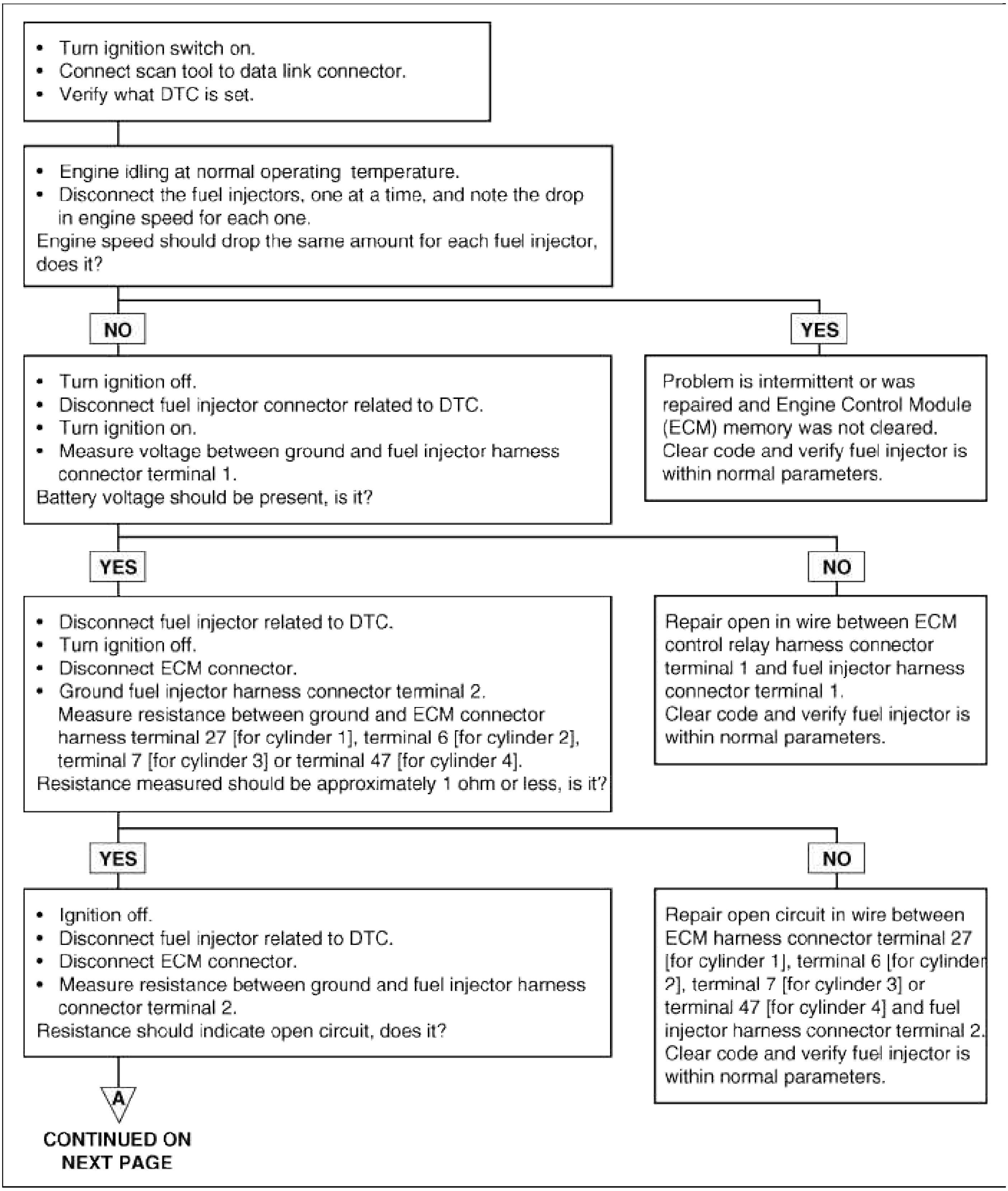
The ECM will set a code and the MIL will turn on if an open circuit or short to ground is detected in the fuel injector circuit during two driving cycles.

CIRCUIT DIAGRAM


ECM
fusible link
5
2
ENGINE
CONTROL
RELAY
1
4
1
1
1
1
Inject
#1
Inject
#2
Inject
#3
Inject
#4
2
2
2
2
27
6
7
47
14
Inject #1
Inject #2
Inject #3
Inject #4
Engine
control
relay
E C M

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn ignition switch on.
- Connect scan tool to data link connector.
- Verify what DTC is set.

- Engine idling at normal operating temperature.
- Disconnect the fuel injectors, one at a time, and note the drop in engine speed for each one.

Engine speed should drop the same amount for each fuel injector, does it?

NO

- Turn ignition off.
- Disconnect fuel injector connector related to DTC.
- Turn ignition on.
- Measure voltage between ground and fuel injector harness connector terminal 1.

Battery voltage should be present, is it?

YES

Problem is intermittent or was repaired and Engine Control Module (ECM) memory was not cleared. Clear code and verify fuel injector is within normal parameters.

YES

- Disconnect fuel injector related to DTC.
- Turn ignition off.
- Disconnect ECM connector.
- Ground fuel injector harness connector terminal 2. Measure resistance between ground and ECM connector harness terminal 27 [for cylinder 1], terminal 6 [for cylinder 2], terminal 7 [for cylinder 3] or terminal 47 [for cylinder 4].

Resistance measured should be approximately 1 ohm or less, is it?

NO

Repair open in wire between ECM control relay harness connector terminal 1 and fuel injector harness connector terminal 1. Clear code and verify fuel injector is within normal parameters.

YES

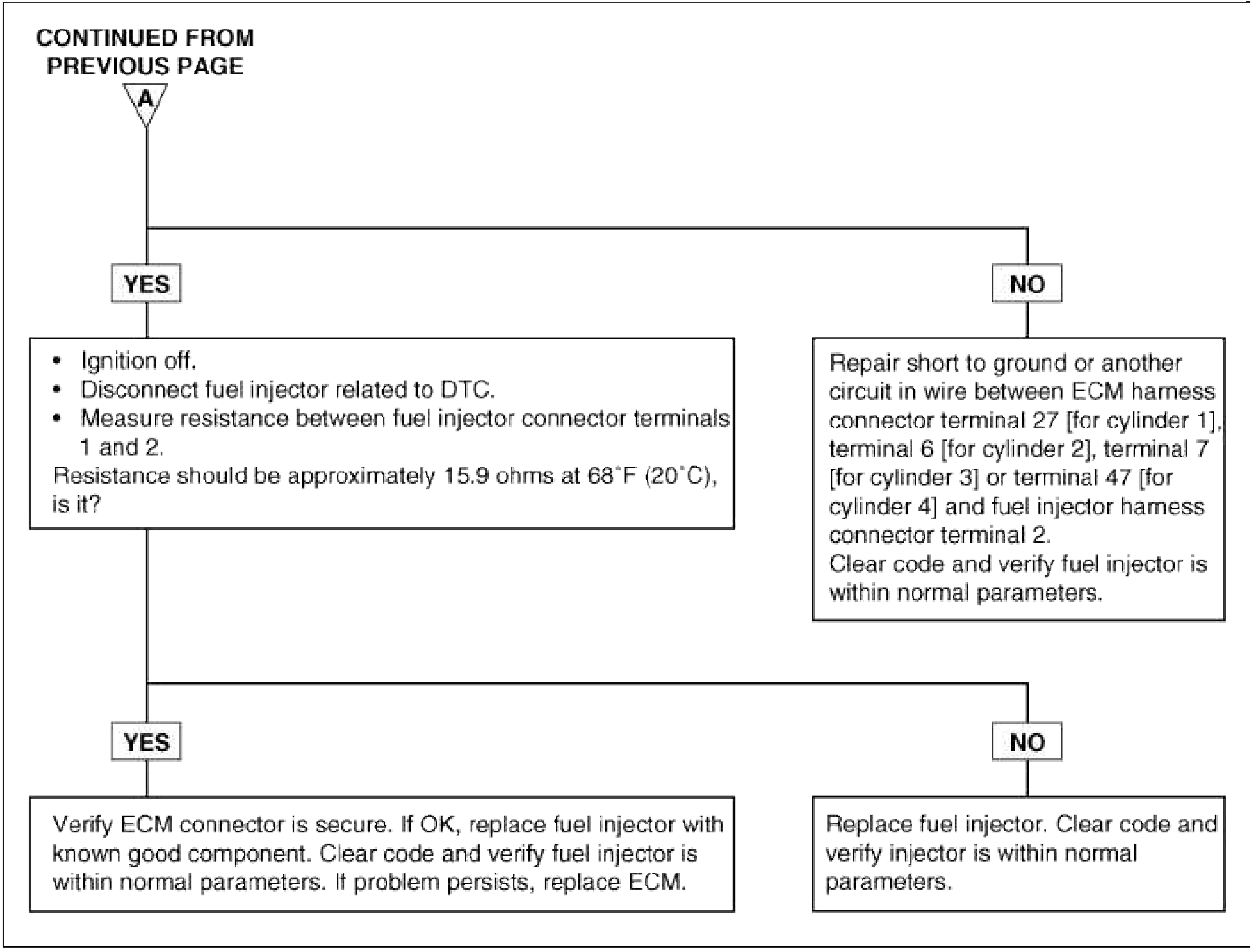
- Ignition off.
- Disconnect fuel injector related to DTC.
- Disconnect ECM connector.
- Measure resistance between ground and fuel injector harness connector terminal 2.

Resistance should indicate open circuit, does it?

NO

Repair open circuit in wire between ECM harness connector terminal 27 [for cylinder 1], terminal 6 [for cylinde 2], terminal 7 [for cylinder 3] or terminal 47 [for cylinder 4] and fuel injector harness connector terminal 2. Clear code and verify fuel injector is within normal parameters.

CONTINUED ON
NEXT PAGE



- Ignition off.
- Disconnect fuel injector related to DTC.
- Measure resistance between fuel injector connector terminals 1 and 2.

Resistance should be approximately 15.9 ohms at 68°F (20°C), is it?

Repair short to ground or another circuit in wire between ECM harness connector terminal 27 [for cylinder 1], terminal 6 [for cylinder 2], terminal 7 [for cylinder 3] or terminal 47 [for cylinder 4] and fuel injector harness connector terminal 2. Clear code and verify fuel injector is within normal parameters.

Verify ECM connector is secure. If OK, replace fuel injector with known good component. Clear code and verify fuel injector is within normal parameters. If problem persists, replace ECM.

Replace fuel injector. Clear code and verify injector is within normal parameters.

Fuel System > Troubleshooting > P0262

[P0261/P0262/P0264/P0265/P0267/P0268/P0270/P0271]

DTC	Diagnostic item
P0261 P0262 P0264 P0265 P0267 P0268 P0270 P0271	Injector Circuit Low Input - Cylinder 1 Injector Circuit High Input - Cylinder 1 Injector Circuit Low Input - Cylinder 2 Injector Circuit High Input - Cylinder 2 Injector Circuit Low Input - Cylinder 3 Injector Circuit High Input - Cylinder 3 Injector Circuit Low Input - Cylinder 4 Injector Circuit High Input - Cylinder 4

DESCRIPTION

The fuel injectors are solenoid operated valves. When a fuel injector solenoid is energized (pulsed) the injector needle valve opens, allowing pressurized fuel to pass through the injector and mix with air entering the engine.

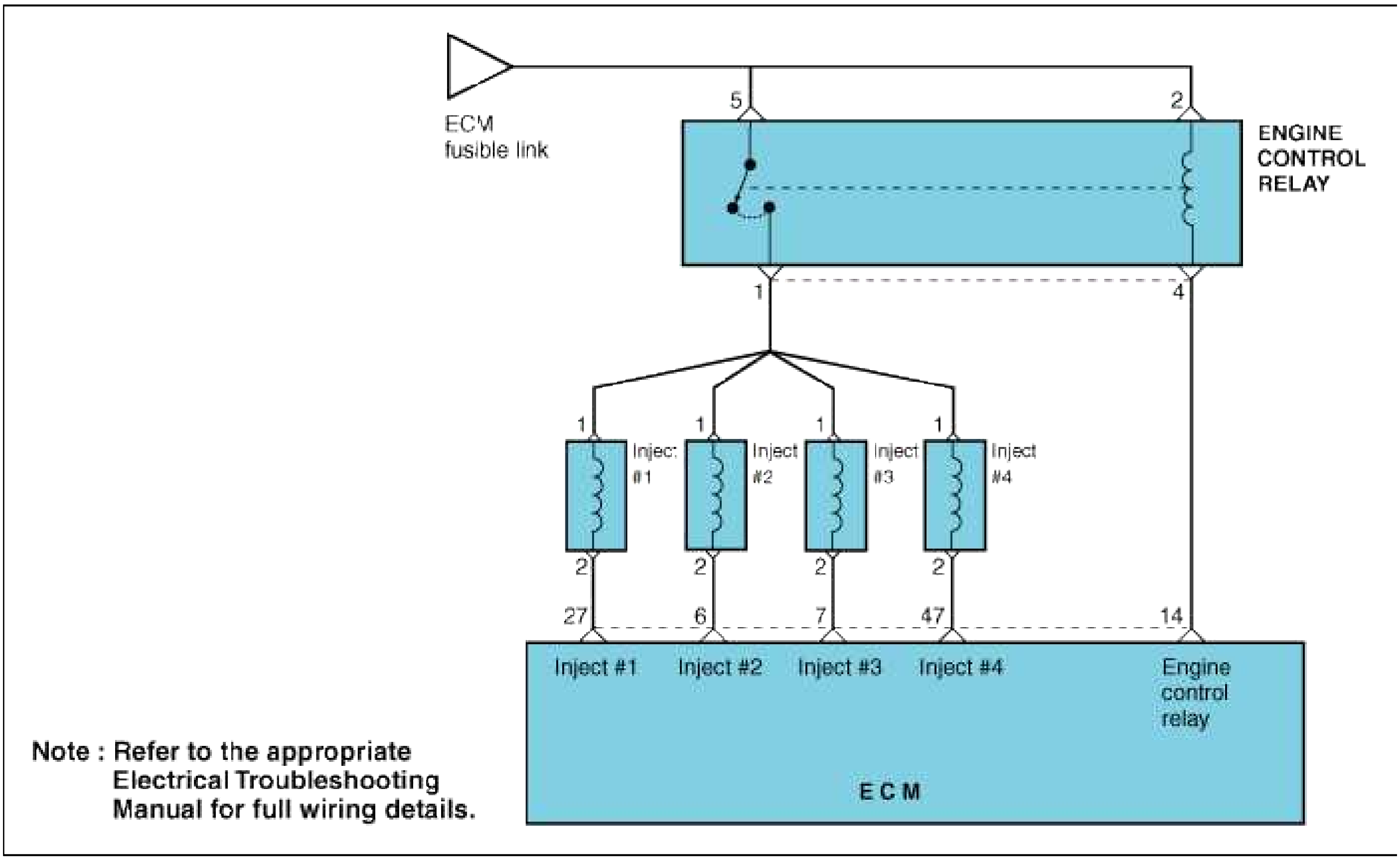
The Engine Control Module (ECM) controls injector timing and pulse width. The ECM pulses the fuel injectors based on information provided by its network of engine sensors. The ECM uses the crankshaft position sensor to determine when to pulse the injectors. Engine coolant temperature, intake air temperature, air flow, and throttle position data are all used by the ECM to calculate injector pulse width.

The ECM also uses its network of sensors to determine whether all injectors should be pulsed at the same time (simultaneous injection) or each injector should be pulsed individually (sequential injection). Sequential injection is almost always used during normal engine operation. Simultaneous injection may be used when the engine is being cranked.

FAILURE CONDITIONS

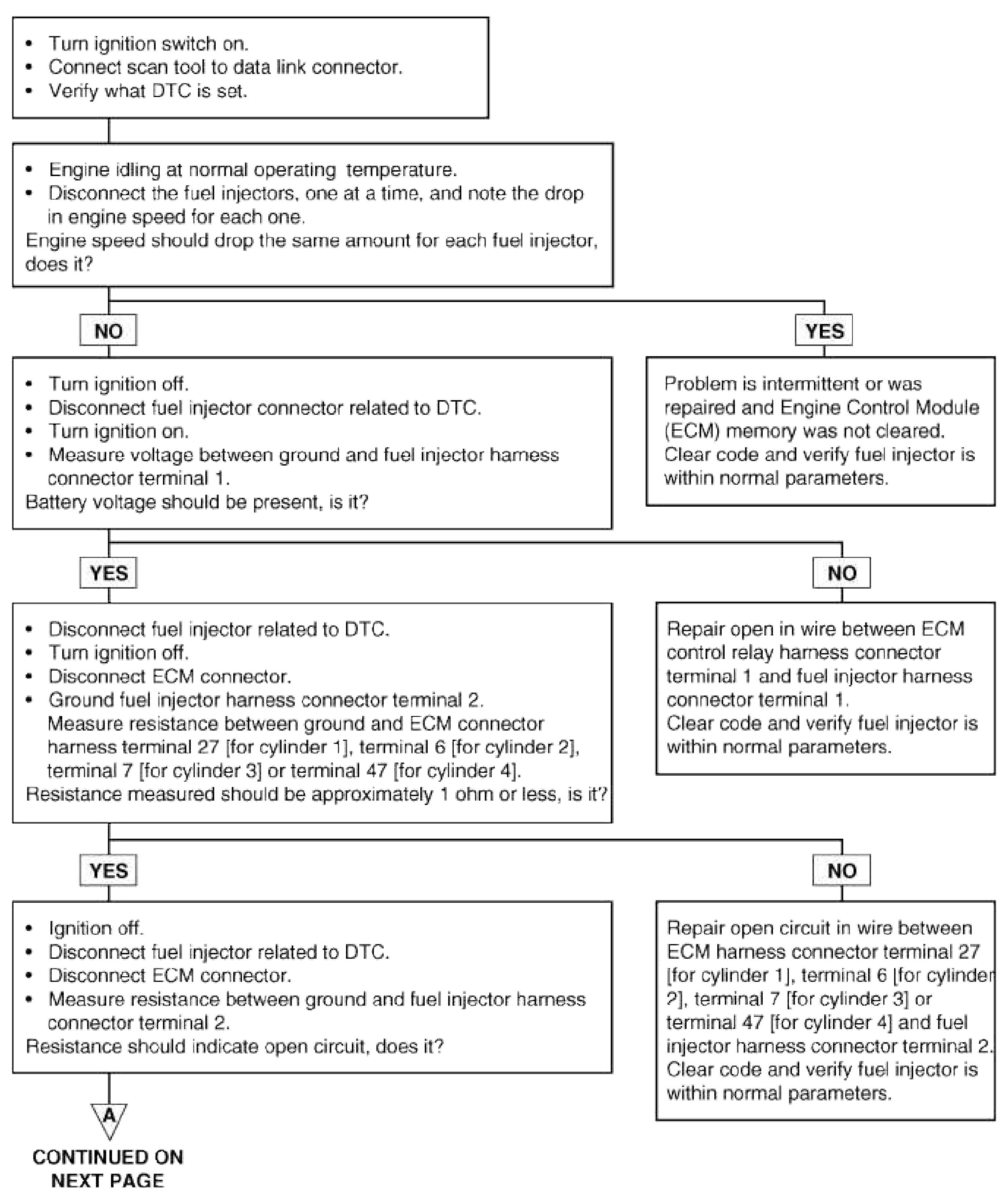
The ECM will set a code and the MIL will turn on if an open circuit or short to ground is detected in the fuel injector circuit during two driving cycles.

CIRCUIT DIAGRAM


ECM
fusible link
5
2
ENGINE
CONTROL
RELAY
1
4
1
1
1
1
Injec:
#1
Inject
#2
Inject
#3
Inject
#4
2
2
2
2
27
6
7
47
14
Inject #1
Inject #2
Inject #3
Inject #4
Engine
control
relay
E C M

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn ignition switch on.
- Connect scan tool to data link connector.
- Verify what DTC is set.

- Engine idling at normal operating temperature.
- Disconnect the fuel injectors, one at a time, and note the drop in engine speed for each one.

Engine speed should drop the same amount for each fuel injector, does it?

- Turn ignition off.
- Disconnect fuel injector connector related to DTC.
- Turn ignition on.
- Measure voltage between ground and fuel injector harness connector terminal 1.

Battery voltage should be present, is it?

Problem is intermittent or was repaired and Engine Control Module (ECM) memory was not cleared. Clear code and verify fuel injector is within normal parameters.

- Disconnect fuel injector related to DTC.
- Turn ignition off.
- Disconnect ECM connector.
- Ground fuel injector harness connector terminal 2. Measure resistance between ground and ECM connector harness terminal 27 [for cylinder 1], terminal 6 [for cylinder 2], terminal 7 [for cylinder 3] or terminal 47 [for cylinder 4].

Resistance measured should be approximately 1 ohm or less, is it?

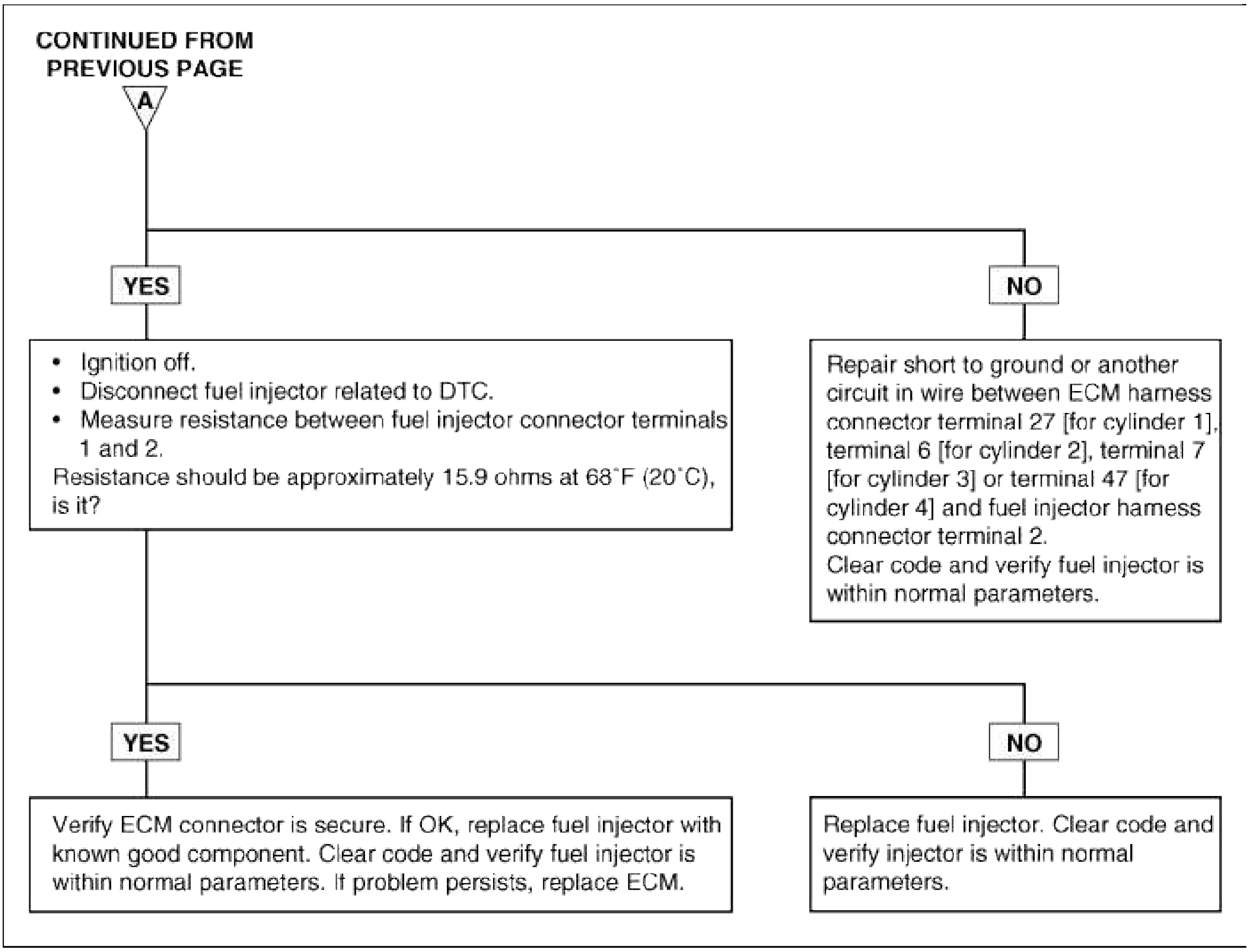
Repair open in wire between ECM control relay harness connector terminal 1 and fuel injector harness connector terminal 1. Clear code and verify fuel injector is within normal parameters.

- Ignition off.
- Disconnect fuel injector related to DTC.
- Disconnect ECM connector.
- Measure resistance between ground and fuel injector harness connector terminal 2.

Resistance should indicate open circuit, does it?

Repair open circuit in wire between ECM harness connector terminal 27 [for cylinder 1], terminal 6 [for cylinde 2], terminal 7 [for cylinder 3] or terminal 47 [for cylinder 4] and fuel injector harness connector terminal 2. Clear code and verify fuel injector is within normal parameters.

CONTINUED ON NEXT PAGE



- Ignition off.
- Disconnect fuel injector related to DTC.
- Measure resistance between fuel injector connector terminals 1 and 2.

Resistance should be approximately 15.9 ohms at 68°F (20°C), is it?

Repair short to ground or another circuit in wire between ECM harness connector terminal 27 [for cylinder 1], terminal 6 [for cylinder 2], terminal 7 [for cylinder 3] or terminal 47 [for cylinder 4] and fuel injector harness connector terminal 2. Clear code and verify fuel injector is within normal parameters.

Verify ECM connector is secure. If OK, replace fuel injector with known good component. Clear code and verify fuel injector is within normal parameters. If problem persists, replace ECM.

Replace fuel injector. Clear code and verify injector is within normal parameters.

Fuel System > Troubleshooting > P0264

[P0261/P0262/P0264/P0265/P0267/P0268/P0270/P0271]

DTC	Diagnostic item
P0261 P0262 P0264 P0265 P0267 P0268 P0270 P0271	Injector Circuit Low Input - Cylinder 1 Injector Circuit High Input - Cylinder 1 Injector Circuit Low Input - Cylinder 2 Injector Circuit High Input - Cylinder 2 Injector Circuit Low Input - Cylinder 3 Injector Circuit High Input - Cylinder 3 Injector Circuit Low Input - Cylinder 4 Injector Circuit High Input - Cylinder 4

DESCRIPTION

The fuel injectors are solenoid operated valves. When a fuel injector solenoid is energized (pulsed) the injector needle valve opens, allowing pressurized fuel to pass through the injector and mix with air entering the engine.

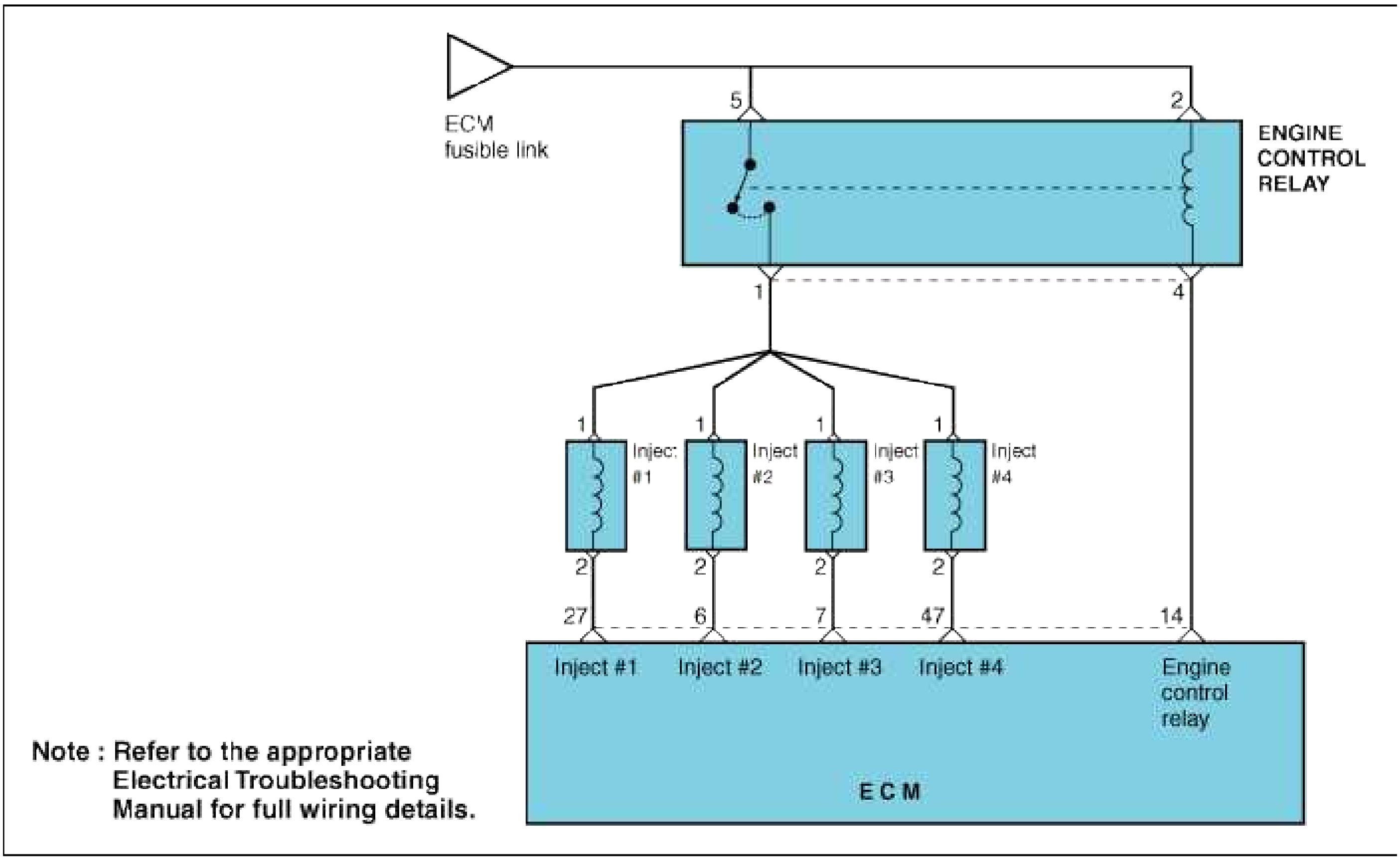
The Engine Control Module (ECM) controls injector timing and pulse width. The ECM pulses the fuel injectors based on information provided by its network of engine sensors. The ECM uses the crankshaft position sensor to determine when to pulse the injectors. Engine coolant temperature, intake air temperature, air flow, and throttle position data are all used by the ECM to calculate injector pulse width.

The ECM also uses its network of sensors to determine whether all injectors should be pulsed at the same time (simultaneous injection) or each injector should be pulsed individually (sequential injection). Sequential injection is almost always used during normal engine operation. Simultaneous injection may be used when the engine is being cranked.

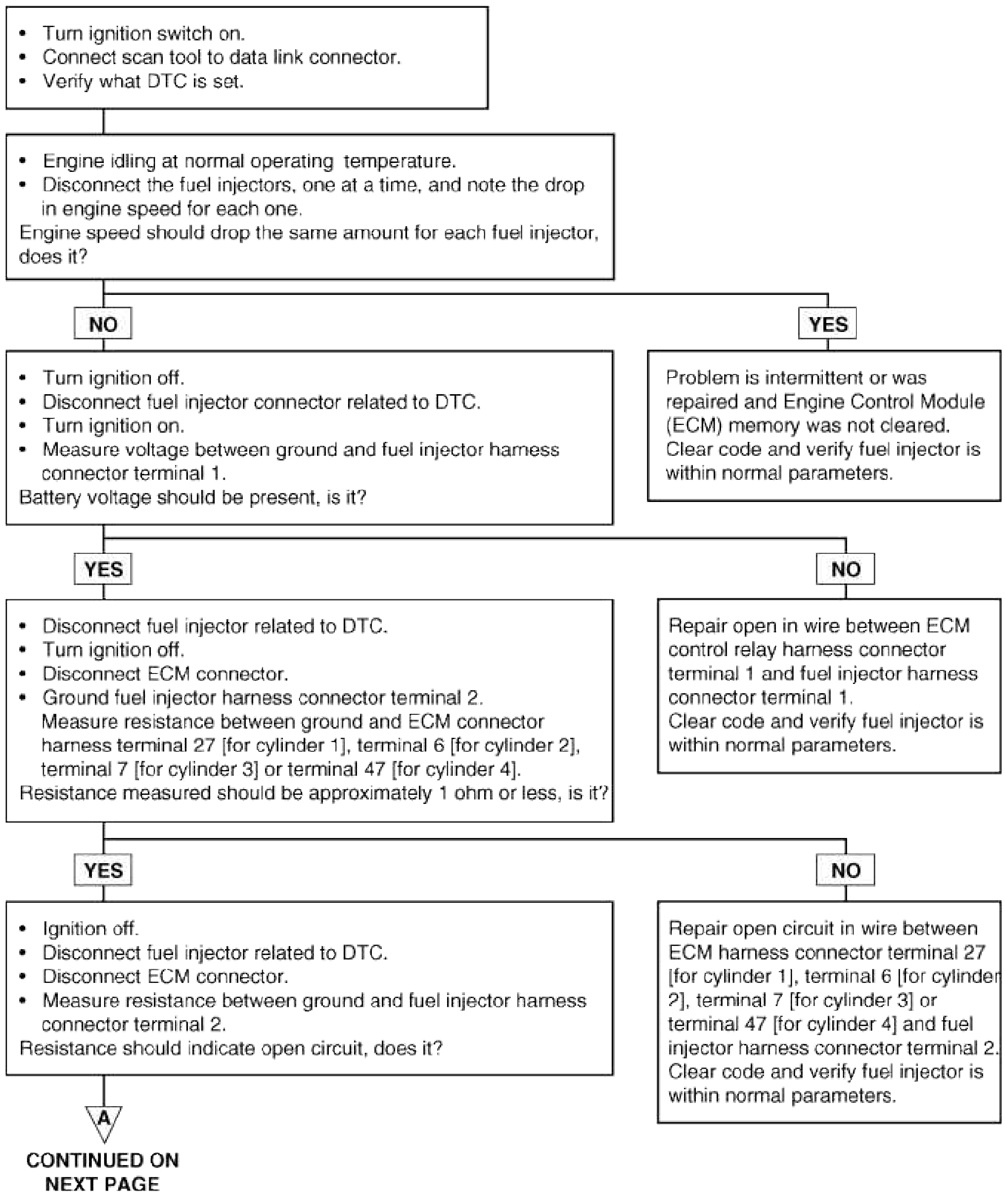
FAILURE CONDITIONS

The ECM will set a code and the MIL will turn on if an open circuit or short to ground is detected in the fuel injector circuit during two driving cycles.

CIRCUIT DIAGRAM


ECM
fusible link
5
2
ENGINE
CONTROL
RELAY
1
4
1
1
1
1
Injec:
#1
Inject
#2
Inject
#3
Inject
#4
2
2
2
2
27
6
7
47
14
Inject #1
Inject #2
Inject #3
Inject #4
Engine
control
relay
ECM
Note : Refer to the appropriate
Electrical Troubleshooting
Manual for full wiring details.

TEST PROCEDURE



- Turn ignition switch on.
- Connect scan tool to data link connector.
- Verify what DTC is set.

- Engine idling at normal operating temperature.
- Disconnect the fuel injectors, one at a time, and note the drop in engine speed for each one.

Engine speed should drop the same amount for each fuel injector, does it?

NO

- Turn ignition off.
- Disconnect fuel injector connector related to DTC.
- Turn ignition on.
- Measure voltage between ground and fuel injector harness connector terminal 1.

Battery voltage should be present, is it?

YES

Problem is intermittent or was repaired and Engine Control Module (ECM) memory was not cleared. Clear code and verify fuel injector is within normal parameters.

YES

- Disconnect fuel injector related to DTC.
- Turn ignition off.
- Disconnect ECM connector.
- Ground fuel injector harness connector terminal 2. Measure resistance between ground and ECM connector harness terminal 27 [for cylinder 1], terminal 6 [for cylinder 2], terminal 7 [for cylinder 3] or terminal 47 [for cylinder 4].

Resistance measured should be approximately 1 ohm or less, is it?

NO

Repair open in wire between ECM control relay harness connector terminal 1 and fuel injector harness connector terminal 1. Clear code and verify fuel injector is within normal parameters.

YES

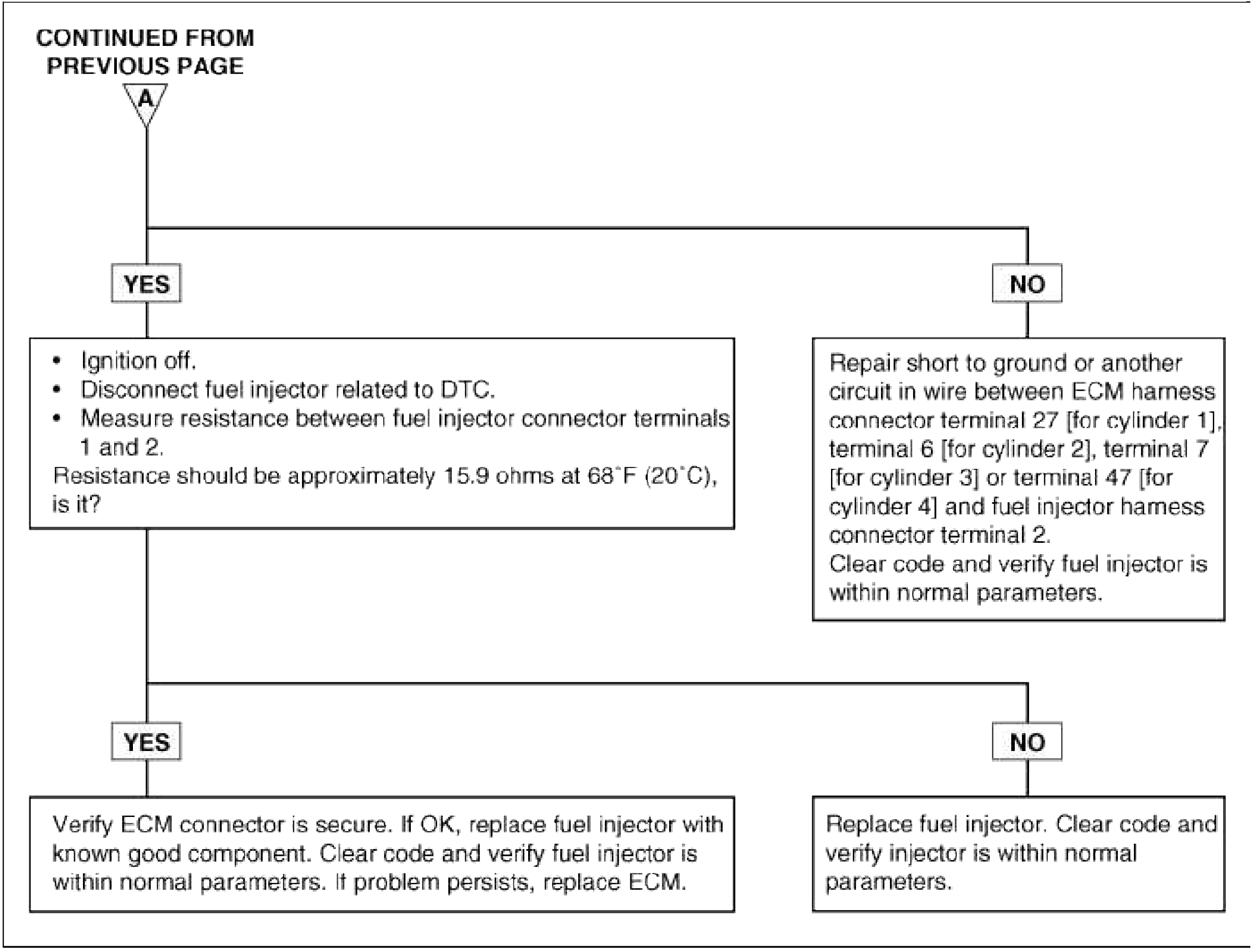
- Ignition off.
- Disconnect fuel injector related to DTC.
- Disconnect ECM connector.
- Measure resistance between ground and fuel injector harness connector terminal 2.

Resistance should indicate open circuit, does it?

NO

Repair open circuit in wire between ECM harness connector terminal 27 [for cylinder 1], terminal 6 [for cylinde 2], terminal 7 [for cylinder 3] or terminal 47 [for cylinder 4] and fuel injector harness connector terminal 2. Clear code and verify fuel injector is within normal parameters.

CONTINUED ON
NEXT PAGE



- Ignition off.
- Disconnect fuel injector related to DTC.
- Measure resistance between fuel injector connector terminals 1 and 2.

Resistance should be approximately 15.9 ohms at 68°F (20°C), is it?

Repair short to ground or another circuit in wire between ECM harness connector terminal 27 [for cylinder 1], terminal 6 [for cylinder 2], terminal 7 [for cylinder 3] or terminal 47 [for cylinder 4] and fuel injector harness connector terminal 2. Clear code and verify fuel injector is within normal parameters.

Verify ECM connector is secure. If OK, replace fuel injector with known good component. Clear code and verify fuel injector is within normal parameters. If problem persists, replace ECM.

Replace fuel injector. Clear code and verify injector is within normal parameters.

Fuel System > Troubleshooting > P0265

[P0261/P0262/P0264/P0265/P0267/P0268/P0270/P0271]

DTC	Diagnostic item
P0261 P0262 P0264 P0265 P0267 P0268 P0270 P0271	Injector Circuit Low Input - Cylinder 1 Injector Circuit High Input - Cylinder 1 Injector Circuit Low Input - Cylinder 2 Injector Circuit High Input - Cylinder 2 Injector Circuit Low Input - Cylinder 3 Injector Circuit High Input - Cylinder 3 Injector Circuit Low Input - Cylinder 4 Injector Circuit High Input - Cylinder 4

DESCRIPTION

The fuel injectors are solenoid operated valves. When a fuel injector solenoid is energized (pulsed) the injector needle valve opens, allowing pressurized fuel to pass through the injector and mix with air entering the engine.

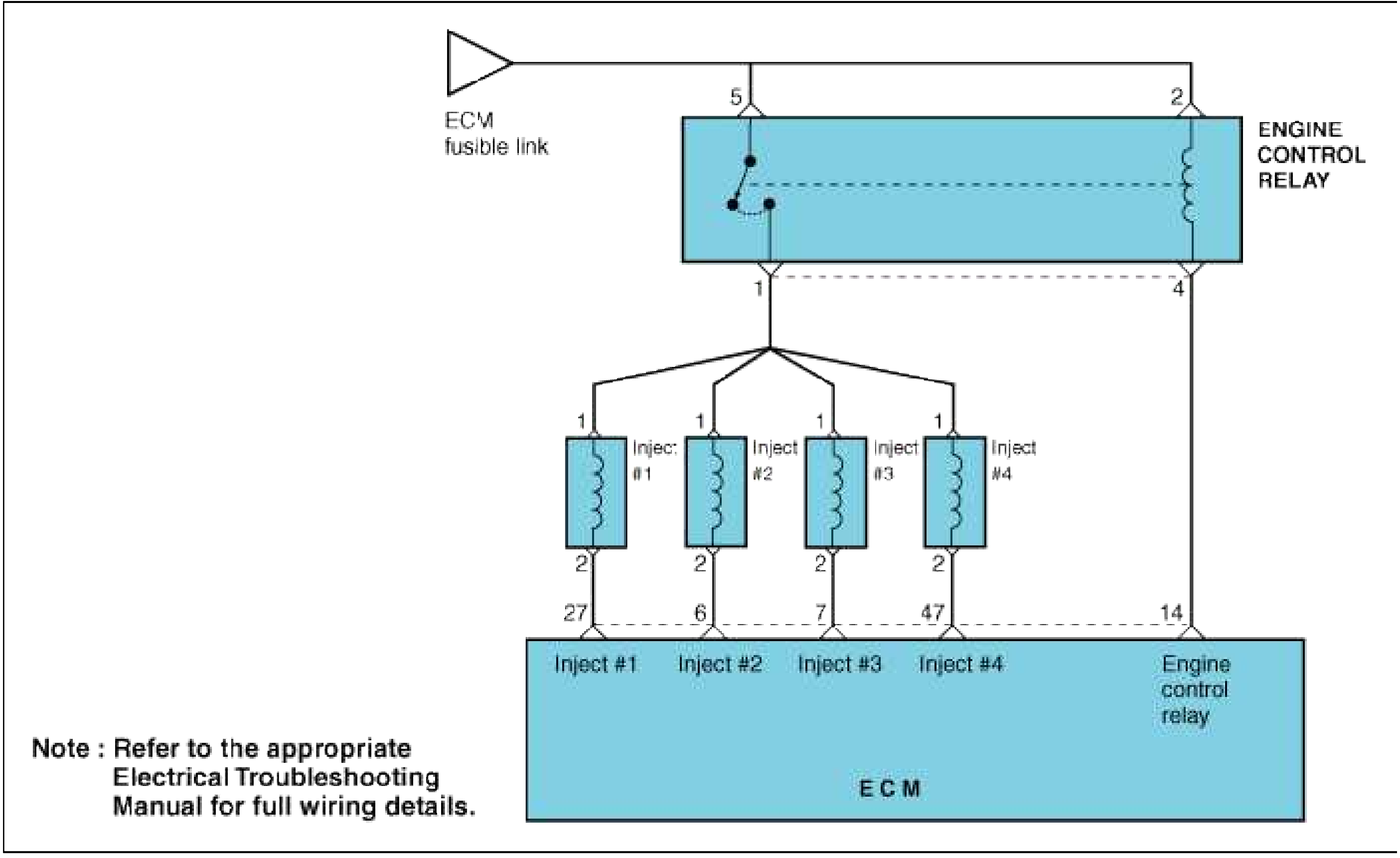
The Engine Control Module (ECM) controls injector timing and pulse width. The ECM pulses the fuel injectors based on information provided by its network of engine sensors. The ECM uses the crankshaft position sensor to determine when to pulse the injectors. Engine coolant temperature, intake air temperature, air flow, and throttle position data are all used by the ECM to calculate injector pulse width.

The ECM also uses its network of sensors to determine whether all injectors should be pulsed at the same time (simultaneous injection) or each injector should be pulsed individually (sequential injection). Sequential injection is almost always used during normal engine operation. Simultaneous injection may be used when the engine is being cranked.

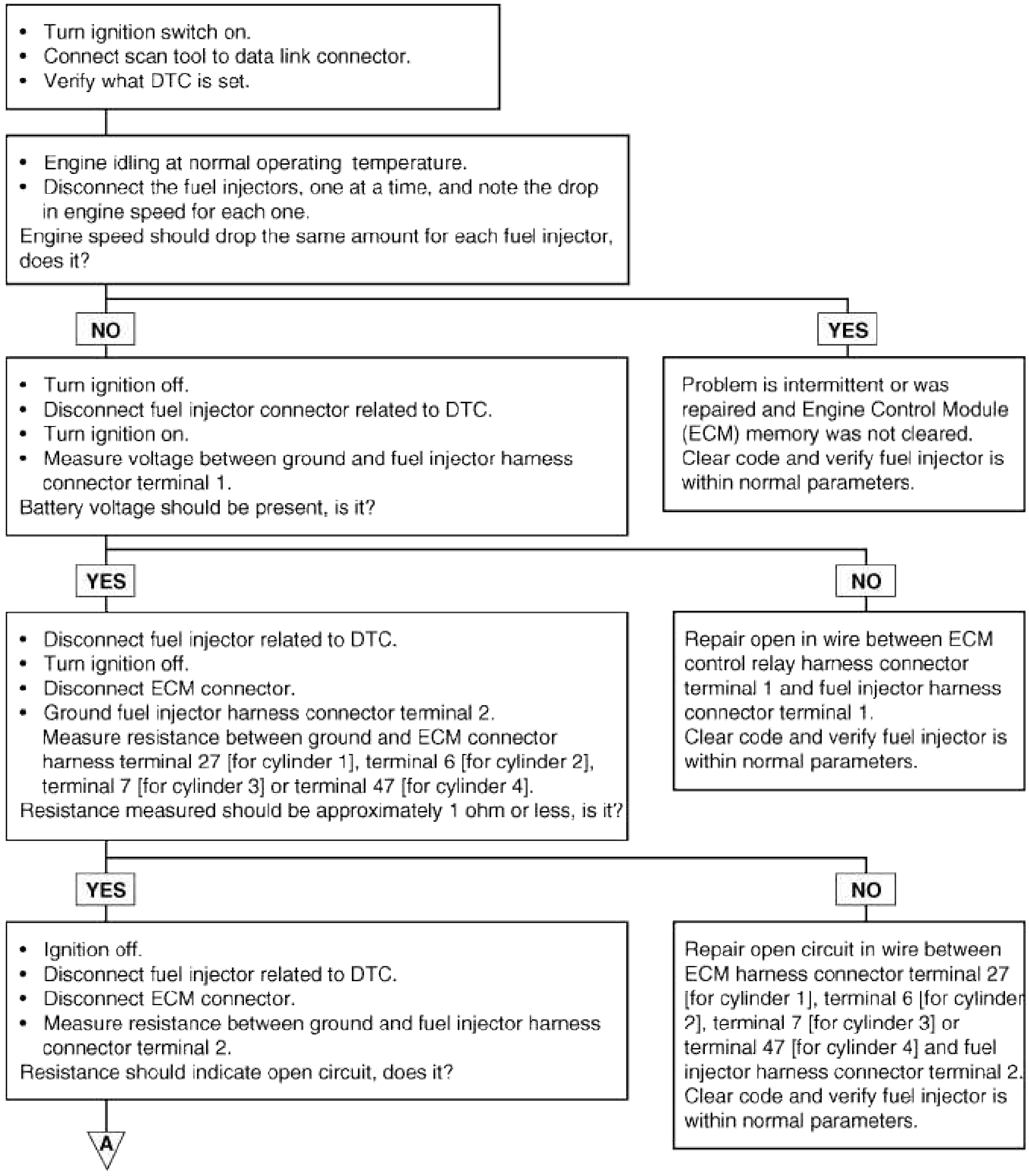
FAILURE CONDITIONS

The ECM will set a code and the MIL will turn on if an open circuit or short to ground is detected in the fuel injector circuit during two driving cycles.

CIRCUIT DIAGRAM


ECM
fusible link
5
2
ENGINE
CONTROL
RELAY
1
4
1
1
1
1
Injec:
#1
Inject
#2
Inject
#3
Inject
#4
2
2
2
2
27
6
7
47
14
Inject #1
Inject #2
Inject #3
Inject #4
Engine
control
relay
E C M
Note : Refer to the appropriate
Electrical Troubleshooting
Manual for full wiring details.

TEST PROCEDURE



- Turn ignition switch on.
- Connect scan tool to data link connector.
- Verify what DTC is set.

- Engine idling at normal operating temperature.
- Disconnect the fuel injectors, one at a time, and note the drop in engine speed for each one.

Engine speed should drop the same amount for each fuel injector, does it?

- Turn ignition off.
- Disconnect fuel injector connector related to DTC.
- Turn ignition on.
- Measure voltage between ground and fuel injector harness connector terminal 1.

Battery voltage should be present, is it?

Problem is intermittent or was repaired and Engine Control Module (ECM) memory was not cleared. Clear code and verify fuel injector is within normal parameters.

- Disconnect fuel injector related to DTC.
- Turn ignition off.
- Disconnect ECM connector.
- Ground fuel injector harness connector terminal 2. Measure resistance between ground and ECM connector harness terminal 27 [for cylinder 1], terminal 6 [for cylinder 2], terminal 7 [for cylinder 3] or terminal 47 [for cylinder 4].

Resistance measured should be approximately 1 ohm or less, is it?

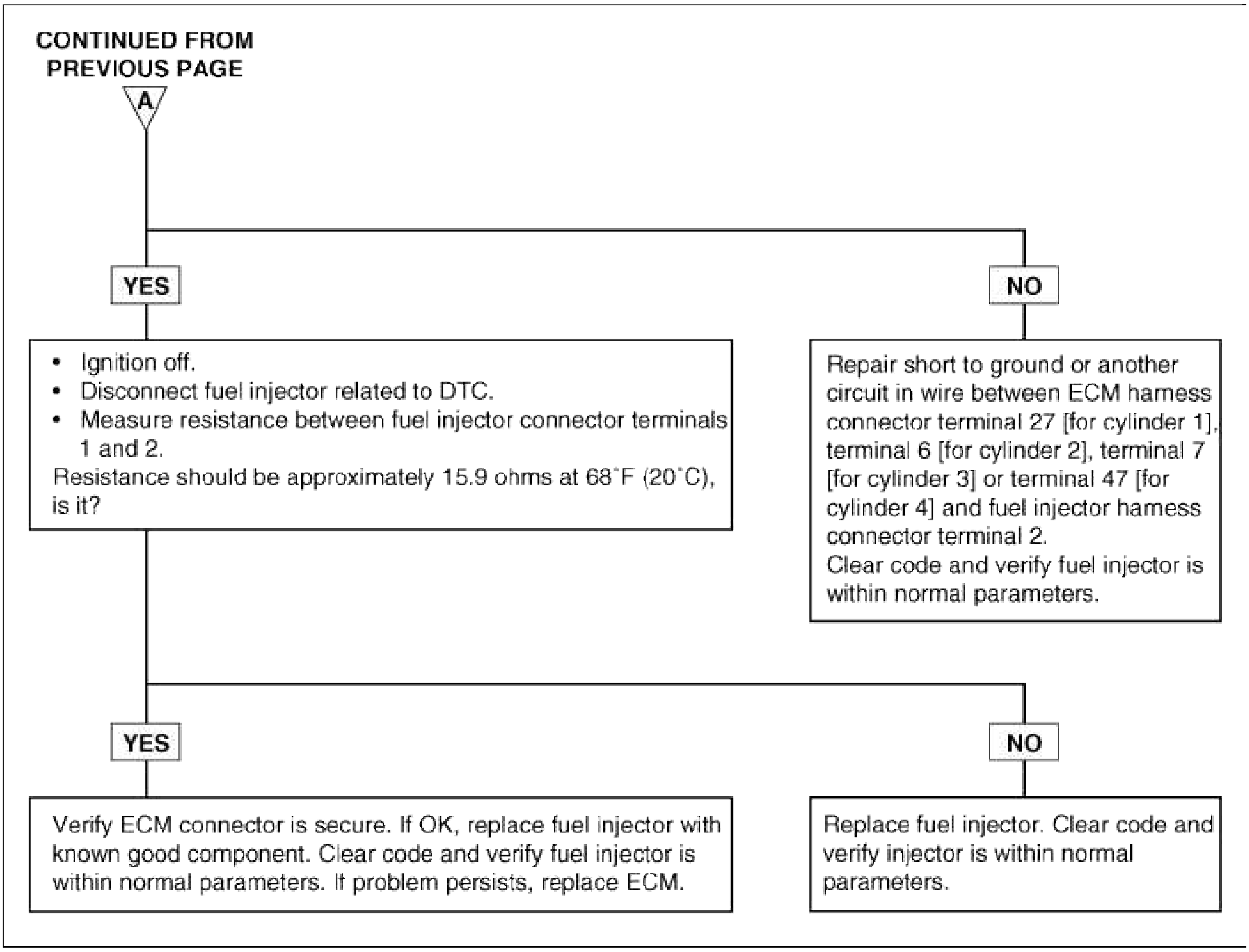
Repair open in wire between ECM control relay harness connector terminal 1 and fuel injector harness connector terminal 1. Clear code and verify fuel injector is within normal parameters.

- Ignition off.
- Disconnect fuel injector related to DTC.
- Disconnect ECM connector.
- Measure resistance between ground and fuel injector harness connector terminal 2.

Resistance should indicate open circuit, does it?

Repair open circuit in wire between ECM harness connector terminal 27 [for cylinder 1], terminal 6 [for cylinder 2], terminal 7 [for cylinder 3] or terminal 47 [for cylinder 4] and fuel injector harness connector terminal 2. Clear code and verify fuel injector is within normal parameters.

CONTINUED ON
NEXT PAGE



- Ignition off.
- Disconnect fuel injector related to DTC.
- Measure resistance between fuel injector connector terminals 1 and 2.

Resistance should be approximately 15.9 ohms at 68°F (20°C), is it?

Repair short to ground or another circuit in wire between ECM harness connector terminal 27 [for cylinder 1], terminal 6 [for cylinder 2], terminal 7 [for cylinder 3] or terminal 47 [for cylinder 4] and fuel injector harness connector terminal 2. Clear code and verify fuel injector is within normal parameters.

Verify ECM connector is secure. If OK, replace fuel injector with known good component. Clear code and verify fuel injector is within normal parameters. If problem persists, replace ECM.

Replace fuel injector. Clear code and verify injector is within normal parameters.

Fuel System > Troubleshooting > P0267

[P0261/P0262/P0264/P0265/P0267/P0268/P0270/P0271]

DTC	Diagnostic item
P0261 P0262 P0264 P0265 P0267 P0268 P0270 P0271	Injector Circuit Low Input - Cylinder 1 Injector Circuit High Input - Cylinder 1 Injector Circuit Low Input - Cylinder 2 Injector Circuit High Input - Cylinder 2 Injector Circuit Low Input - Cylinder 3 Injector Circuit High Input - Cylinder 3 Injector Circuit Low Input - Cylinder 4 Injector Circuit High Input - Cylinder 4

DESCRIPTION

The fuel injectors are solenoid operated valves. When a fuel injector solenoid is energized (pulsed) the injector needle valve opens, allowing pressurized fuel to pass through the injector and mix with air entering the engine.

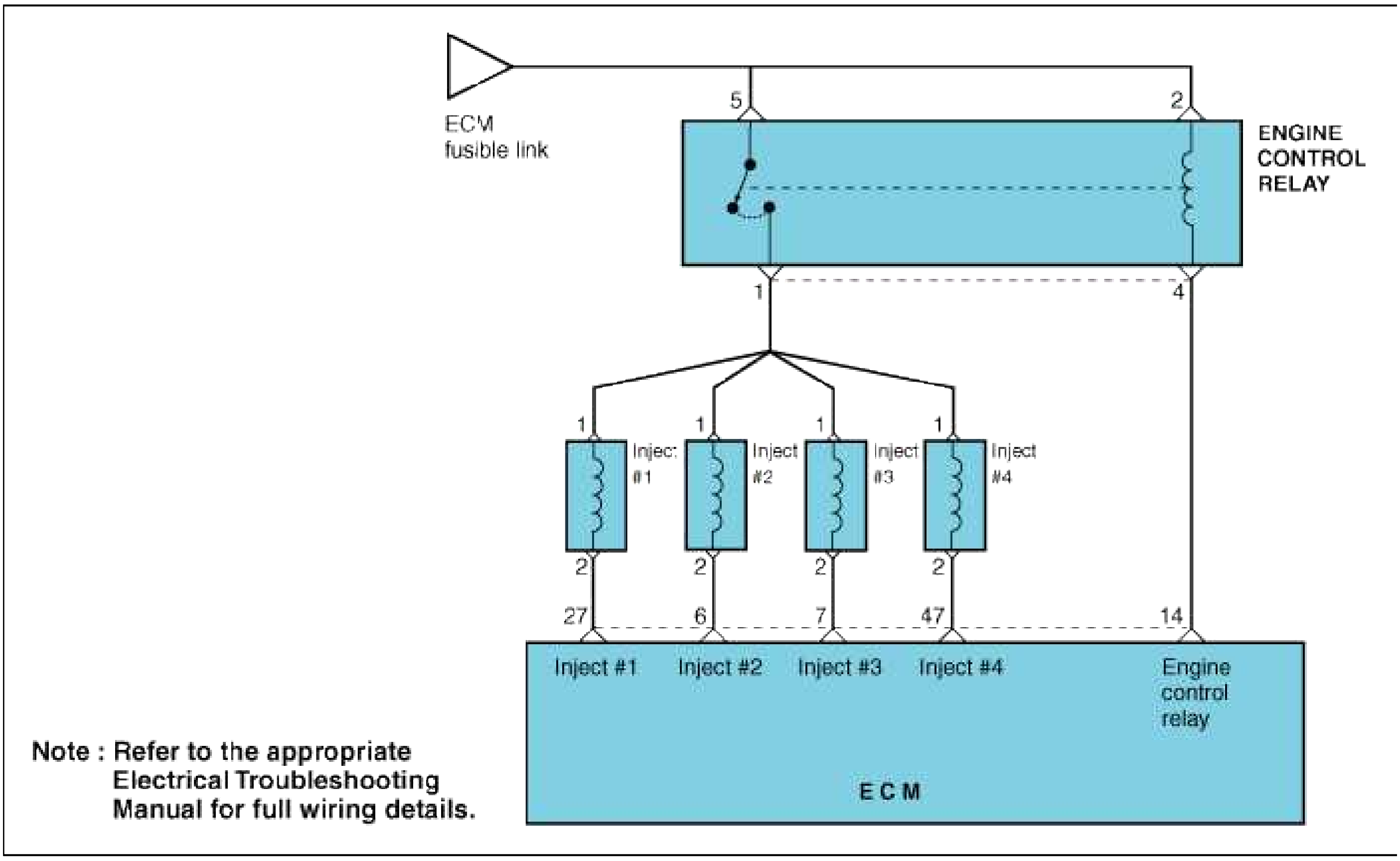
The Engine Control Module (ECM) controls injector timing and pulse width. The ECM pulses the fuel injectors based on information provided by its network of engine sensors. The ECM uses the crankshaft position sensor to determine when to pulse the injectors. Engine coolant temperature, intake air temperature, air flow, and throttle position data are all used by the ECM to calculate injector pulse width.

The ECM also uses its network of sensors to determine whether all injectors should be pulsed at the same time (simultaneous injection) or each injector should be pulsed individually (sequential injection). Sequential injection is almost always used during normal engine operation. Simultaneous injection may be used when the engine is being cranked.

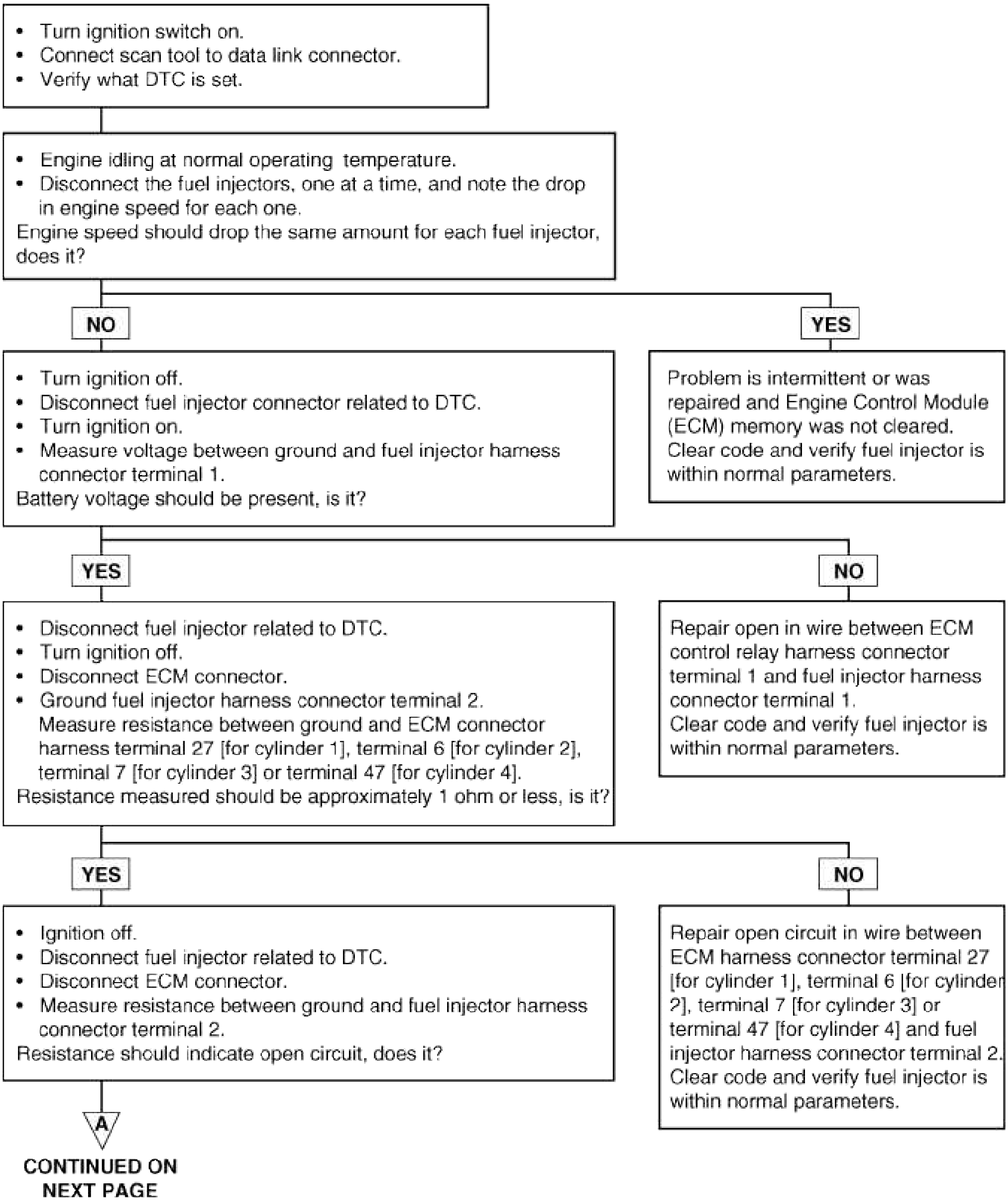
FAILURE CONDITIONS

The ECM will set a code and the MIL will turn on if an open circuit or short to ground is detected in the fuel injector circuit during two driving cycles.

CIRCUIT DIAGRAM


ECM fusible link
5
2
ENGINE CONTROL RELAY
1
4
1
1
1
1
Injec: #1
Inject #2
Inject #3
Inject #4
2
2
2
2
27
6
7
47
14
Inject #1
Inject #2
Inject #3
Inject #4
Engine control relay
ECM
Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn ignition switch on.
- Connect scan tool to data link connector.
- Verify what DTC is set.

- Engine idling at normal operating temperature.
- Disconnect the fuel injectors, one at a time, and note the drop in engine speed for each one.

Engine speed should drop the same amount for each fuel injector, does it?

NO

- Turn ignition off.
- Disconnect fuel injector connector related to DTC.
- Turn ignition on.
- Measure voltage between ground and fuel injector harness connector terminal 1.

Battery voltage should be present, is it?

YES

Problem is intermittent or was repaired and Engine Control Module (ECM) memory was not cleared. Clear code and verify fuel injector is within normal parameters.

YES

- Disconnect fuel injector related to DTC.
- Turn ignition off.
- Disconnect ECM connector.
- Ground fuel injector harness connector terminal 2. Measure resistance between ground and ECM connector harness terminal 27 [for cylinder 1], terminal 6 [for cylinder 2], terminal 7 [for cylinder 3] or terminal 47 [for cylinder 4].

Resistance measured should be approximately 1 ohm or less, is it?

NO

Repair open in wire between ECM control relay harness connector terminal 1 and fuel injector harness connector terminal 1. Clear code and verify fuel injector is within normal parameters.

YES

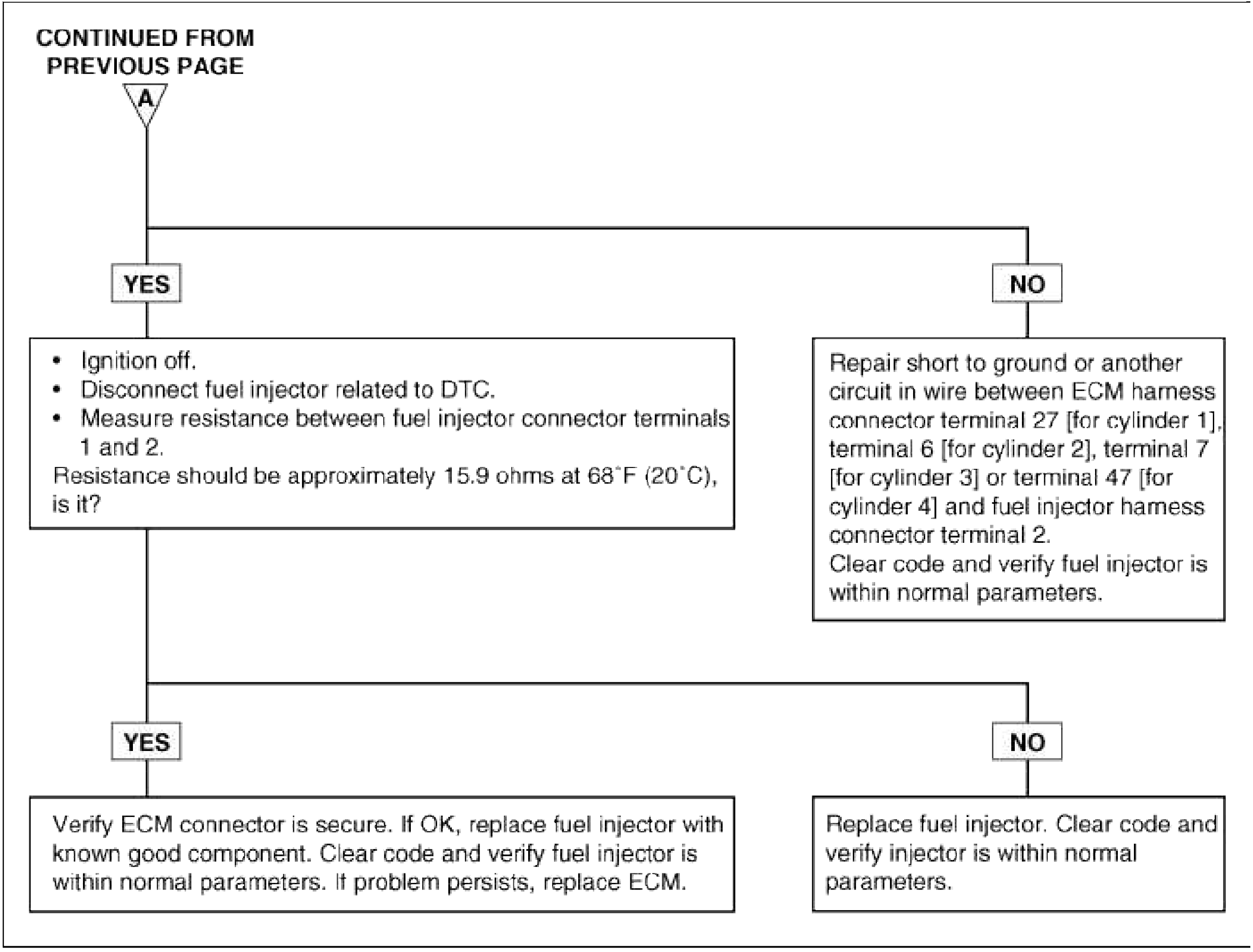
- Ignition off.
- Disconnect fuel injector related to DTC.
- Disconnect ECM connector.
- Measure resistance between ground and fuel injector harness connector terminal 2.

Resistance should indicate open circuit, does it?

NO

Repair open circuit in wire between ECM harness connector terminal 27 [for cylinder 1], terminal 6 [for cylinde 2], terminal 7 [for cylinder 3] or terminal 47 [for cylinder 4] and fuel injector harness connector terminal 2. Clear code and verify fuel injector is within normal parameters.

CONTINUED ON NEXT PAGE



- Ignition off.
- Disconnect fuel injector related to DTC.
- Measure resistance between fuel injector connector terminals 1 and 2.

Resistance should be approximately 15.9 ohms at 68°F (20°C), is it?

Repair short to ground or another circuit in wire between ECM harness connector terminal 27 [for cylinder 1], terminal 6 [for cylinder 2], terminal 7 [for cylinder 3] or terminal 47 [for cylinder 4] and fuel injector harness connector terminal 2.
Clear code and verify fuel injector is within normal parameters.

Verify ECM connector is secure. If OK, replace fuel injector with known good component. Clear code and verify fuel injector is within normal parameters. If problem persists, replace ECM.

Replace fuel injector. Clear code and verify injector is within normal parameters.

Fuel System > Troubleshooting > P0268

[P0261/P0262/P0264/P0265/P0267/P0268/P0270/P0271]

DTC	Diagnostic item
P0261 P0262 P0264 P0265 P0267 P0268 P0270 P0271	Injector Circuit Low Input - Cylinder 1 Injector Circuit High Input - Cylinder 1 Injector Circuit Low Input - Cylinder 2 Injector Circuit High Input - Cylinder 2 Injector Circuit Low Input - Cylinder 3 Injector Circuit High Input - Cylinder 3 Injector Circuit Low Input - Cylinder 4 Injector Circuit High Input - Cylinder 4

DESCRIPTION

The fuel injectors are solenoid operated valves. When a fuel injector solenoid is energized (pulsed) the injector needle valve opens, allowing pressurized fuel to pass through the injector and mix with air entering the engine.

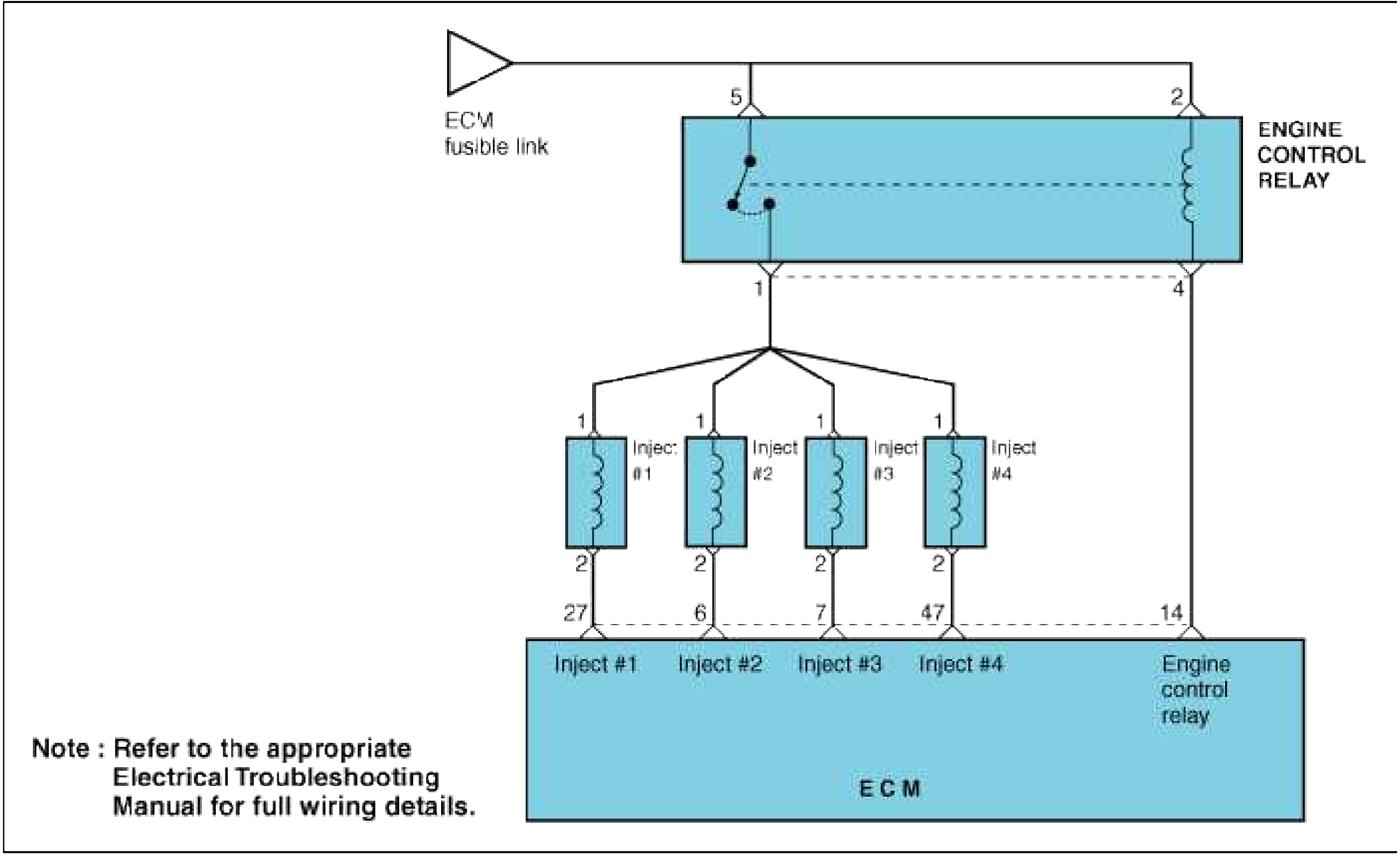
The Engine Control Module (ECM) controls injector timing and pulse width. The ECM pulses the fuel injectors based on information provided by its network of engine sensors. The ECM uses the crankshaft position sensor to determine when to pulse the injectors. Engine coolant temperature, intake air temperature, air flow, and throttle position data are all used by the ECM to calculate injector pulse width.

The ECM also uses its network of sensors to determine whether all injectors should be pulsed at the same time (simultaneous injection) or each injector should be pulsed individually (sequential injection). Sequential injection is almost always used during normal engine operation. Simultaneous injection may be used when the engine is being cranked.

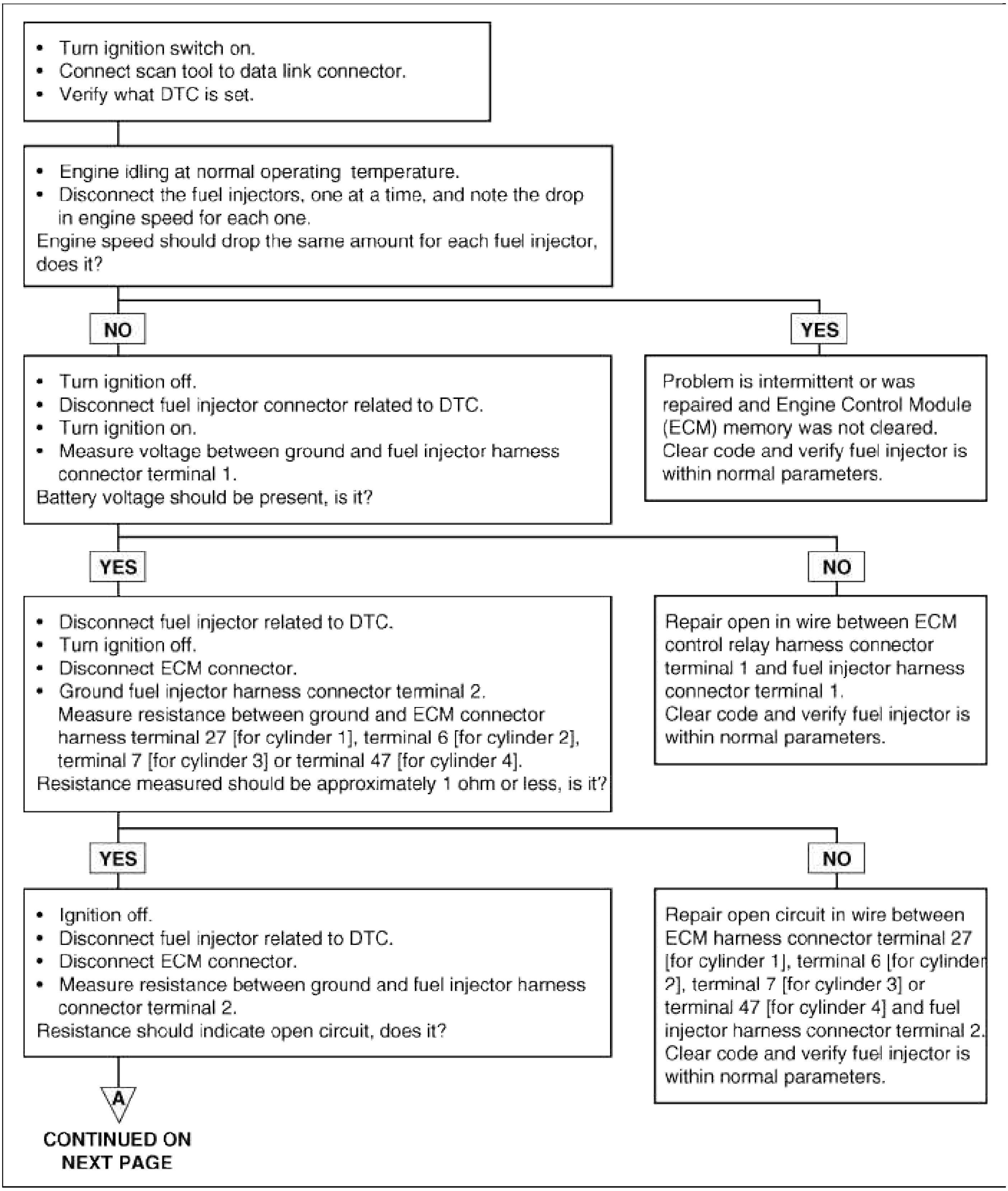
FAILURE CONDITIONS

The ECM will set a code and the MIL will turn on if an open circuit or short to ground is detected in the fuel injector circuit during two driving cycles.

CIRCUIT DIAGRAM


ECM
fusible link
5
2
ENGINE
CONTROL
RELAY
1
4
1
1
1
1
Injec
#1
Inject
#2
Inject
#3
Inject
#4
2
2
2
2
27
6
7
47
14
Inject #1
Inject #2
Inject #3
Inject #4
Engine
control
relay
E C M
Note : Refer to the appropriate
Electrical Troubleshooting
Manual for full wiring details.

TEST PROCEDURE



- Turn ignition switch on.
- Connect scan tool to data link connector.
- Verify what DTC is set.

- Engine idling at normal operating temperature.
- Disconnect the fuel injectors, one at a time, and note the drop in engine speed for each one.

Engine speed should drop the same amount for each fuel injector, does it?

NO

- Turn ignition off.
- Disconnect fuel injector connector related to DTC.
- Turn ignition on.
- Measure voltage between ground and fuel injector harness connector terminal 1.

Battery voltage should be present, is it?

YES

Problem is intermittent or was repaired and Engine Control Module (ECM) memory was not cleared. Clear code and verify fuel injector is within normal parameters.

YES

- Disconnect fuel injector related to DTC.
- Turn ignition off.
- Disconnect ECM connector.
- Ground fuel injector harness connector terminal 2. Measure resistance between ground and ECM connector harness terminal 27 [for cylinder 1], terminal 6 [for cylinder 2], terminal 7 [for cylinder 3] or terminal 47 [for cylinder 4].

Resistance measured should be approximately 1 ohm or less, is it?

NO

Repair open in wire between ECM control relay harness connector terminal 1 and fuel injector harness connector terminal 1.
Clear code and verify fuel injector is within normal parameters.

YES

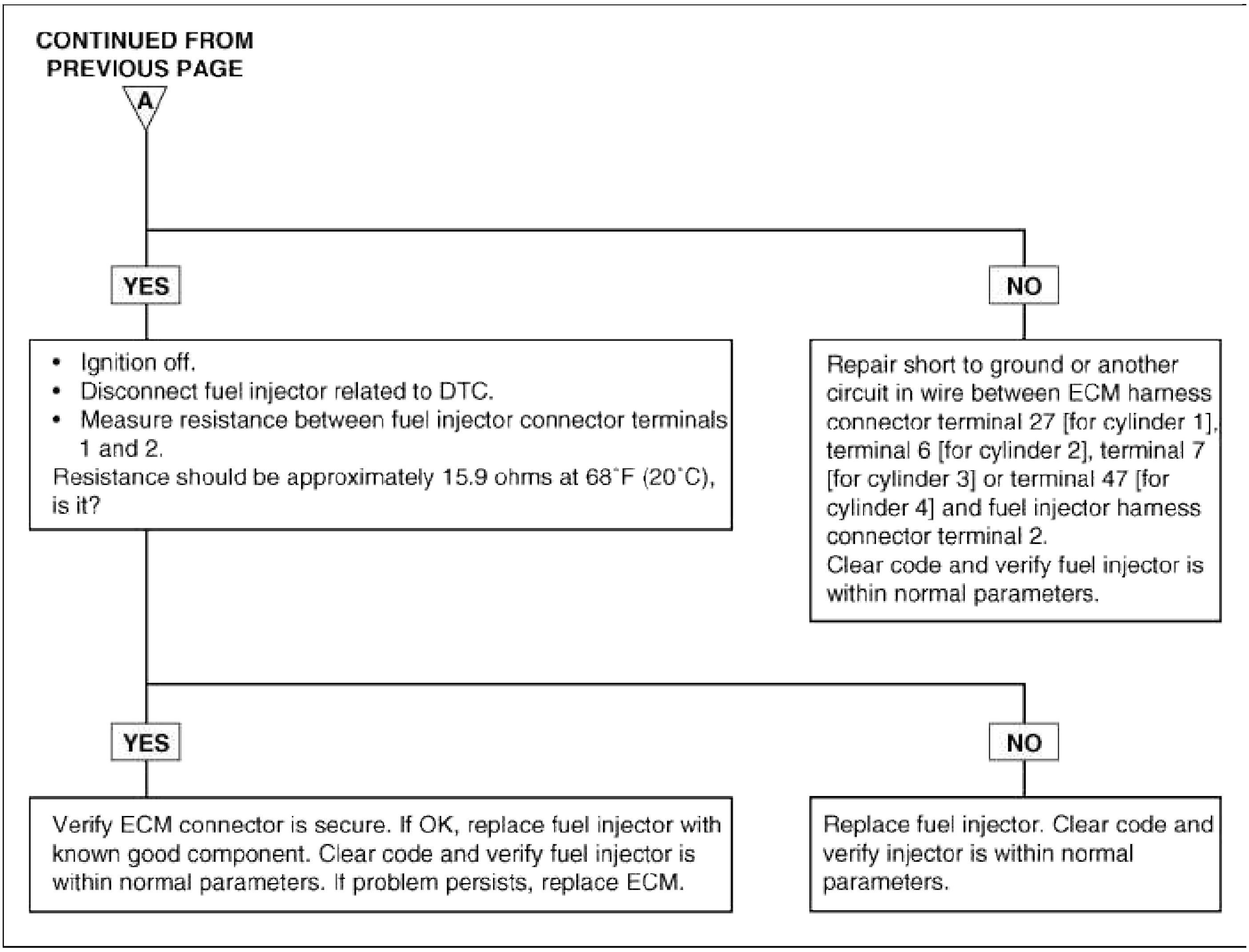
- Ignition off.
- Disconnect fuel injector related to DTC.
- Disconnect ECM connector.
- Measure resistance between ground and fuel injector harness connector terminal 2.

Resistance should indicate open circuit, does it?

NO

Repair open circuit in wire between ECM harness connector terminal 27 [for cylinder 1], terminal 6 [for cylinde 2], terminal 7 [for cylinder 3] or terminal 47 [for cylinder 4] and fuel injector harness connector terminal 2. Clear code and verify fuel injector is within normal parameters.

CONTINUED ON NEXT PAGE



- Ignition off.
- Disconnect fuel injector related to DTC.
- Measure resistance between fuel injector connector terminals 1 and 2.

Resistance should be approximately 15.9 ohms at 68°F (20°C), is it?

Repair short to ground or another circuit in wire between ECM harness connector terminal 27 [for cylinder 1], terminal 6 [for cylinder 2], terminal 7 [for cylinder 3] or terminal 47 [for cylinder 4] and fuel injector harness connector terminal 2.
Clear code and verify fuel injector is within normal parameters.

Verify ECM connector is secure. If OK, replace fuel injector with known good component. Clear code and verify fuel injector is within normal parameters. If problem persists, replace ECM.

Replace fuel injector. Clear code and verify injector is within normal parameters.

Fuel System > Troubleshooting > P0270

[P0261/P0262/P0264/P0265/P0267/P0268/P0270/P0271]

DTC	Diagnostic item
P0261 P0262 P0264 P0265 P0267 P0268 P0270 P0271	Injector Circuit Low Input - Cylinder 1 Injector Circuit High Input - Cylinder 1 Injector Circuit Low Input - Cylinder 2 Injector Circuit High Input - Cylinder 2 Injector Circuit Low Input - Cylinder 3 Injector Circuit High Input - Cylinder 3 Injector Circuit Low Input - Cylinder 4 Injector Circuit High Input - Cylinder 4

DESCRIPTION

The fuel injectors are solenoid operated valves. When a fuel injector solenoid is energized (pulsed) the injector needle valve opens, allowing pressurized fuel to pass through the injector and mix with air entering the engine.

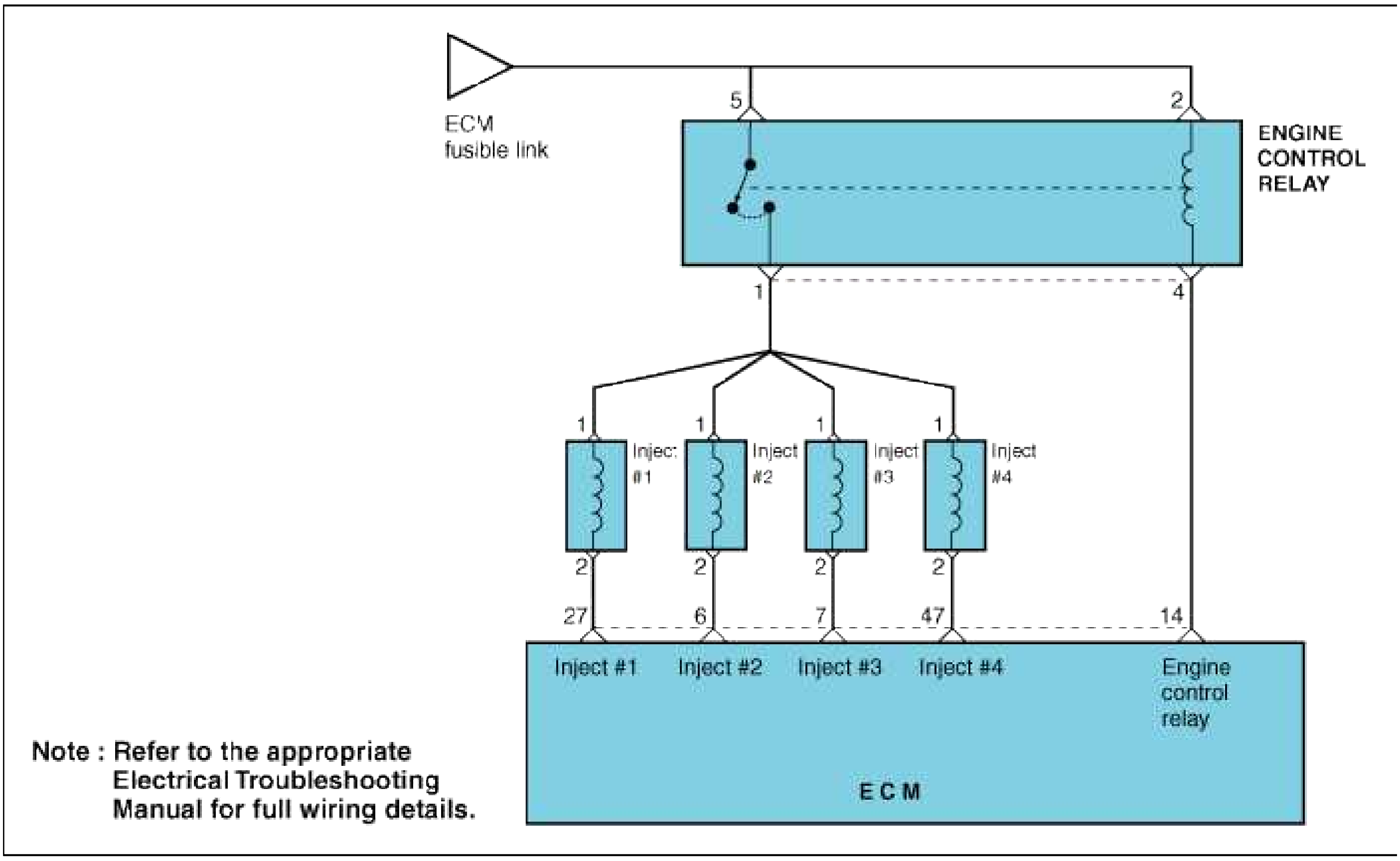
The Engine Control Module (ECM) controls injector timing and pulse width. The ECM pulses the fuel injectors based on information provided by its network of engine sensors. The ECM uses the crankshaft position sensor to determine when to pulse the injectors. Engine coolant temperature, intake air temperature, air flow, and throttle position data are all used by the ECM to calculate injector pulse width.

The ECM also uses its network of sensors to determine whether all injectors should be pulsed at the same time (simultaneous injection) or each injector should be pulsed individually (sequential injection). Sequential injection is almost always used during normal engine operation. Simultaneous injection may be used when the engine is being cranked.

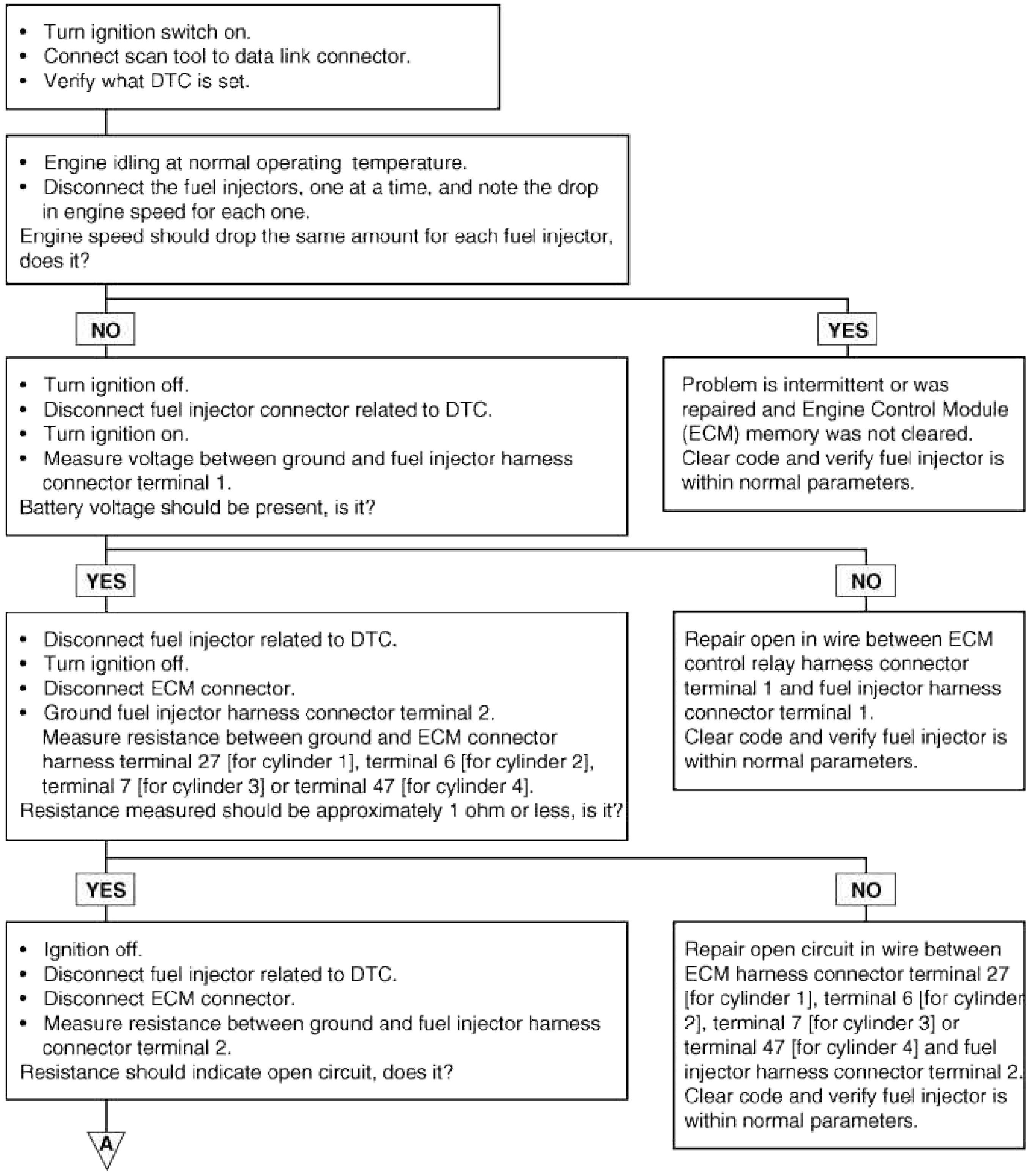
FAILURE CONDITIONS

The ECM will set a code and the MIL will turn on if an open circuit or short to ground is detected in the fuel injector circuit during two driving cycles.

CIRCUIT DIAGRAM


ECM
fusible link
5
2
ENGINE
CONTROL
RELAY
1
4
1
1
1
1
Injec:
#1
Inject
#2
Inject
#3
Inject
#4
2
2
2
2
27
6
7
47
14
Inject #1
Inject #2
Inject #3
Inject #4
Engine
control
relay
ECM
Note : Refer to the appropriate
Electrical Troubleshooting
Manual for full wiring details.

TEST PROCEDURE



- Turn ignition switch on.
- Connect scan tool to data link connector.
- Verify what DTC is set.

- Engine idling at normal operating temperature.
- Disconnect the fuel injectors, one at a time, and note the drop in engine speed for each one.

Engine speed should drop the same amount for each fuel injector, does it?

NO

- Turn ignition off.
- Disconnect fuel injector connector related to DTC.
- Turn ignition on.
- Measure voltage between ground and fuel injector harness connector terminal 1.

Battery voltage should be present, is it?

YES

Problem is intermittent or was repaired and Engine Control Module (ECM) memory was not cleared. Clear code and verify fuel injector is within normal parameters.

YES

- Disconnect fuel injector related to DTC.
- Turn ignition off.
- Disconnect ECM connector.
- Ground fuel injector harness connector terminal 2. Measure resistance between ground and ECM connector harness terminal 27 [for cylinder 1], terminal 6 [for cylinder 2], terminal 7 [for cylinder 3] or terminal 47 [for cylinder 4].

Resistance measured should be approximately 1 ohm or less, is it?

NO

Repair open in wire between ECM control relay harness connector terminal 1 and fuel injector harness connector terminal 1. Clear code and verify fuel injector is within normal parameters.

YES

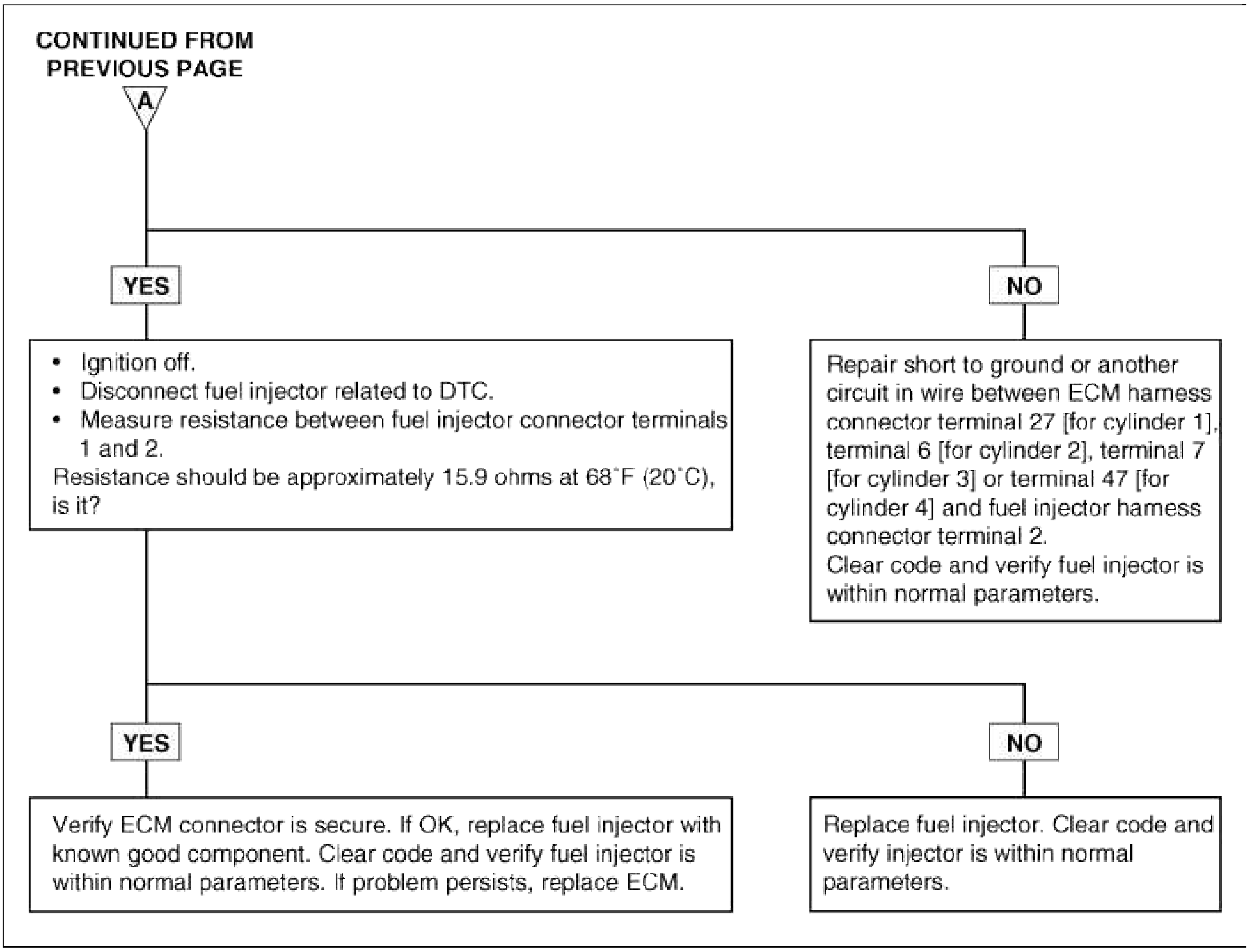
- Ignition off.
- Disconnect fuel injector related to DTC.
- Disconnect ECM connector.
- Measure resistance between ground and fuel injector harness connector terminal 2.

Resistance should indicate open circuit, does it?

NO

Repair open circuit in wire between ECM harness connector terminal 27 [for cylinder 1], terminal 6 [for cylinder 2], terminal 7 [for cylinder 3] or terminal 47 [for cylinder 4] and fuel injector harness connector terminal 2. Clear code and verify fuel injector is within normal parameters.

CONTINUED ON NEXT PAGE



- Ignition off.
- Disconnect fuel injector related to DTC.
- Measure resistance between fuel injector connector terminals 1 and 2.

Resistance should be approximately 15.9 ohms at 68°F (20°C), is it?

Repair short to ground or another circuit in wire between ECM harness connector terminal 27 [for cylinder 1], terminal 6 [for cylinder 2], terminal 7 [for cylinder 3] or terminal 47 [for cylinder 4] and fuel injector harness connector terminal 2.
Clear code and verify fuel injector is within normal parameters.

Verify ECM connector is secure. If OK, replace fuel injector with known good component. Clear code and verify fuel injector is within normal parameters. If problem persists, replace ECM.

Replace fuel injector. Clear code and verify injector is within normal parameters.

Fuel System > Troubleshooting > P0271

[P0261/P0262/P0264/P0265/P0267/P0268/P0270/P0271]

DTC	Diagnostic item
P0261	Injector Circuit Low Input - Cylinder 1
P0262	Injector Circuit High Input - Cylinder 1
P0264	Injector Circuit Low Input - Cylinder 2
P0265	Injector Circuit High Input - Cylinder 2
P0267	Injector Circuit Low Input - Cylinder 3
P0268	Injector Circuit High Input - Cylinder 3
P0270	Injector Circuit Low Input - Cylinder 4
P0271	Injector Circuit High Input - Cylinder 4

DESCRIPTION

The fuel injectors are solenoid operated valves. When a fuel injector solenoid is energized (pulsed) the injector needle valve opens, allowing pressurized fuel to pass through the injector and mix with air entering the engine.

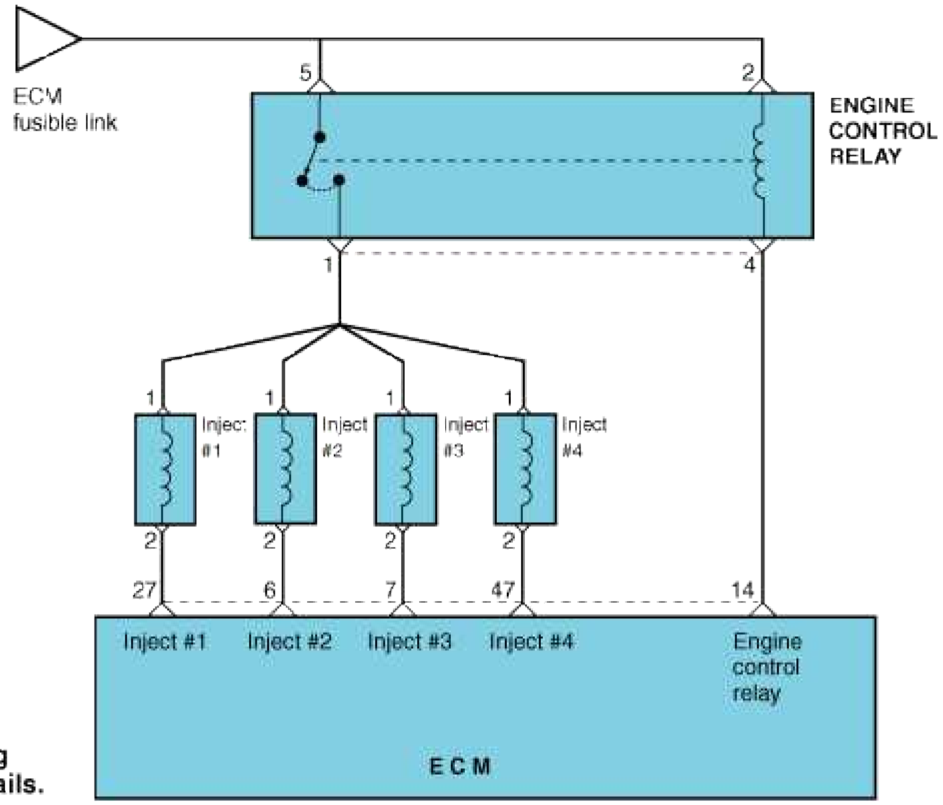
The Engine Control Module (ECM) controls injector timing and pulse width. The ECM pulses the fuel injectors based on information provided by its network of engine sensors. The ECM uses the crankshaft position sensor to determine when to pulse the injectors. Engine coolant temperature, intake air temperature, air flow, and throttle position data are all used by the ECM to calculate injector pulse width.

The ECM also uses its network of sensors to determine whether all injectors should be pulsed at the same time (simultaneous injection) or each injector should be pulsed individually (sequential injection). Sequential injection is almost always used during normal engine operation. Simultaneous injection may be used when the engine is being cranked.

FAILURE CONDITIONS

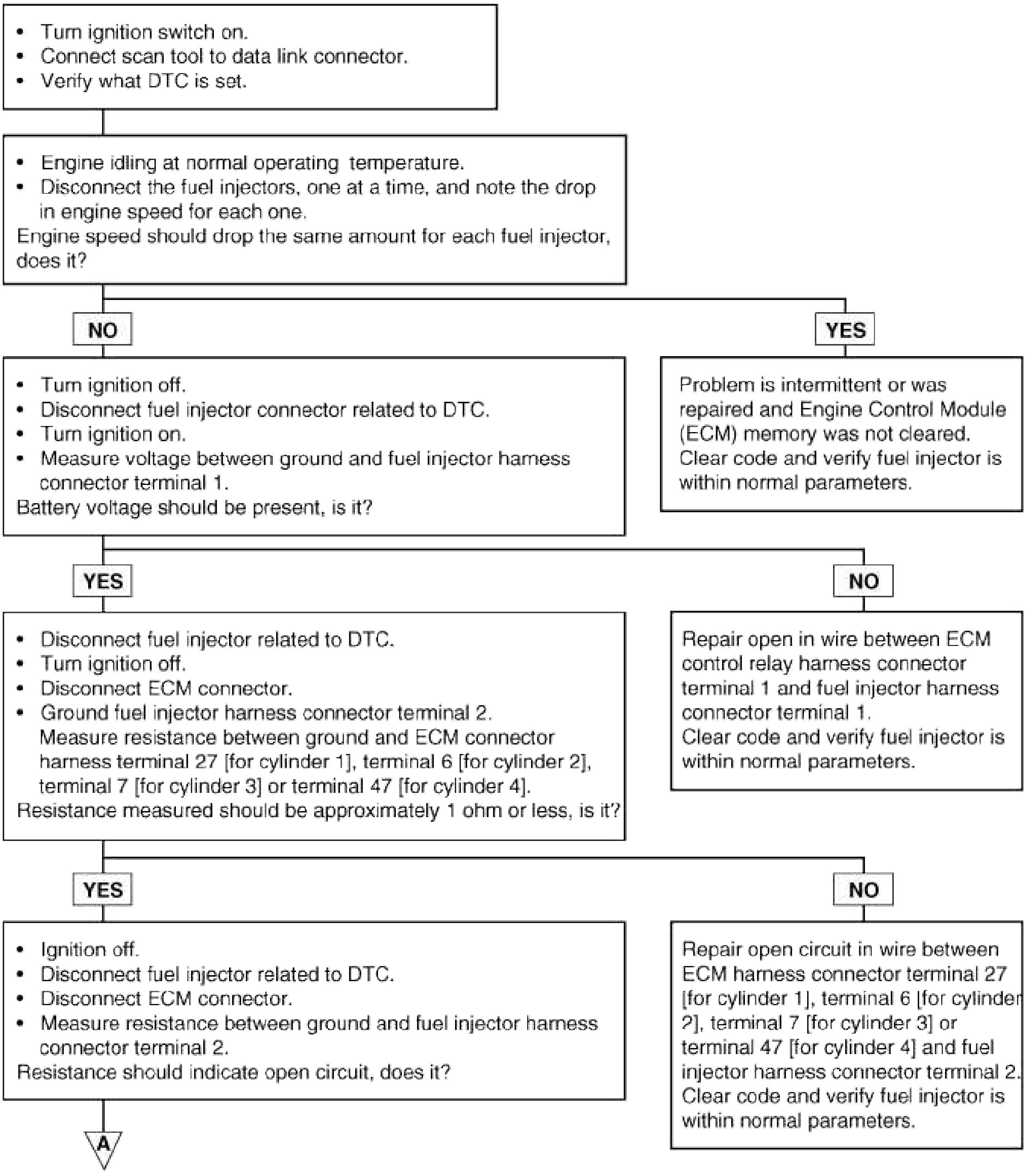
The ECM will set a code and the MIL will turn on if an open circuit or short to ground is detected in the fuel injector circuit during two driving cycles.

CIRCUIT DIAGRAM


ECM
fusible link
5
2
ENGINE
CONTROL
RELAY
1
4
1
1
1
1
Injec:
#1
Inject
#2
Inject
#3
Inject
#4
2
2
2
2
27
6
7
47
14
Inject #1
Inject #2
Inject #3
Inject #4
Engine
control
relay
E C M

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn ignition switch on.
- Connect scan tool to data link connector.
- Verify what DTC is set.

- Engine idling at normal operating temperature.
- Disconnect the fuel injectors, one at a time, and note the drop in engine speed for each one.

Engine speed should drop the same amount for each fuel injector, does it?

NO

- Turn ignition off.
- Disconnect fuel injector connector related to DTC.
- Turn ignition on.
- Measure voltage between ground and fuel injector harness connector terminal 1.

Battery voltage should be present, is it?

YES

Problem is intermittent or was repaired and Engine Control Module (ECM) memory was not cleared. Clear code and verify fuel injector is within normal parameters.

YES

- Disconnect fuel injector related to DTC.
- Turn ignition off.
- Disconnect ECM connector.
- Ground fuel injector harness connector terminal 2. Measure resistance between ground and ECM connector harness terminal 27 [for cylinder 1], terminal 6 [for cylinder 2], terminal 7 [for cylinder 3] or terminal 47 [for cylinder 4].

Resistance measured should be approximately 1 ohm or less, is it?

NO

Repair open in wire between ECM control relay harness connector terminal 1 and fuel injector harness connector terminal 1. Clear code and verify fuel injector is within normal parameters.

YES

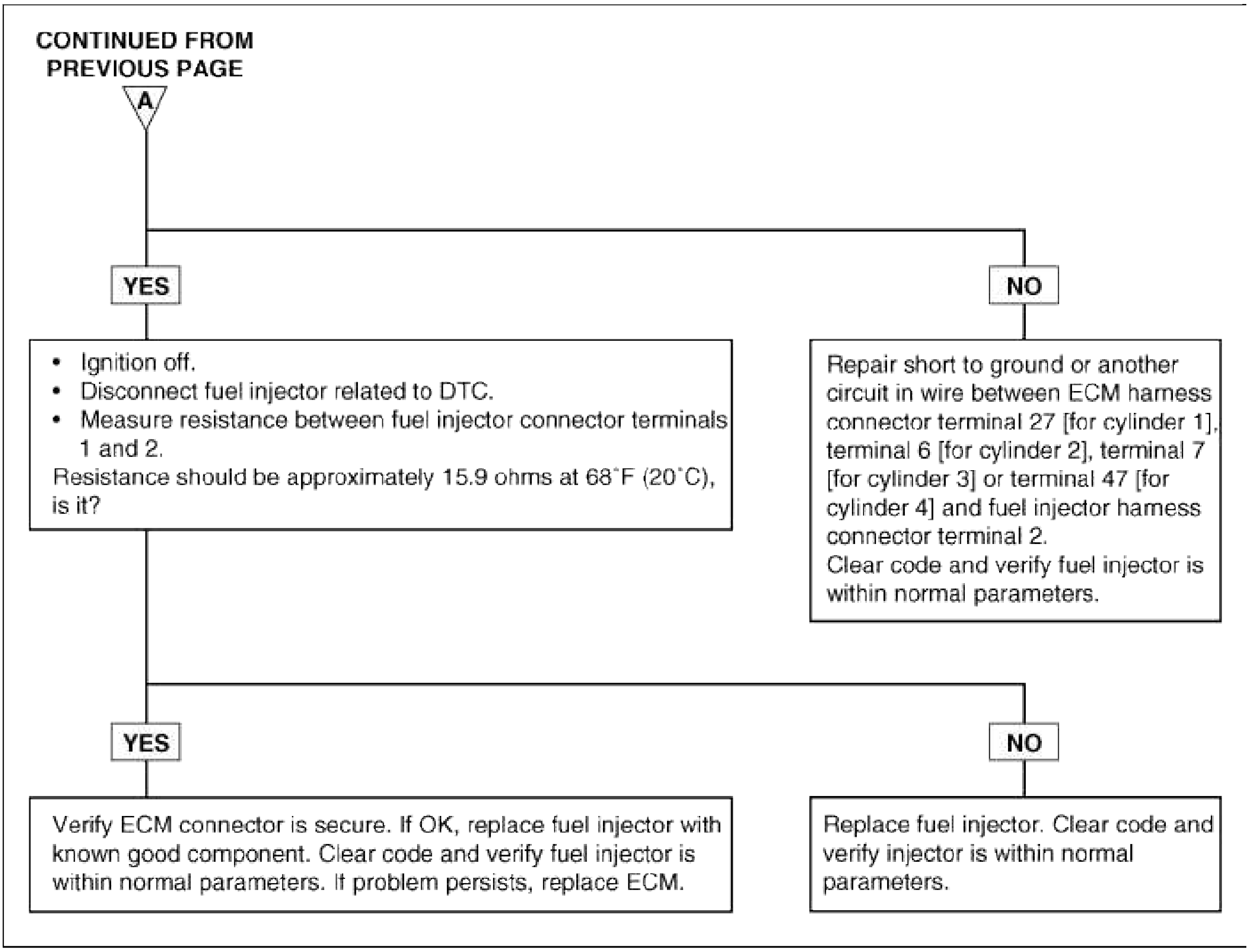
- Ignition off.
- Disconnect fuel injector related to DTC.
- Disconnect ECM connector.
- Measure resistance between ground and fuel injector harness connector terminal 2.

Resistance should indicate open circuit, does it?

NO

Repair open circuit in wire between ECM harness connector terminal 27 [for cylinder 1], terminal 6 [for cylinder 2], terminal 7 [for cylinder 3] or terminal 47 [for cylinder 4] and fuel injector harness connector terminal 2. Clear code and verify fuel injector is within normal parameters.

CONTINUED ON NEXT PAGE



- Ignition off.
- Disconnect fuel injector related to DTC.
- Measure resistance between fuel injector connector terminals 1 and 2.

Resistance should be approximately 15.9 ohms at 68°F (20°C), is it?

Repair short to ground or another circuit in wire between ECM harness connector terminal 27 [for cylinder 1], terminal 6 [for cylinder 2], terminal 7 [for cylinder 3] or terminal 47 [for cylinder 4] and fuel injector harness connector terminal 2. Clear code and verify fuel injector is within normal parameters.

Verify ECM connector is secure. If OK, replace fuel injector with known good component. Clear code and verify fuel injector is within normal parameters. If problem persists, replace ECM.

Replace fuel injector. Clear code and verify injector is within normal parameters.

Fuel System > Troubleshooting > P0325

[P0325]

DTC	Diagnostic item
P0325	Knock Sensor Circuit Malfunction

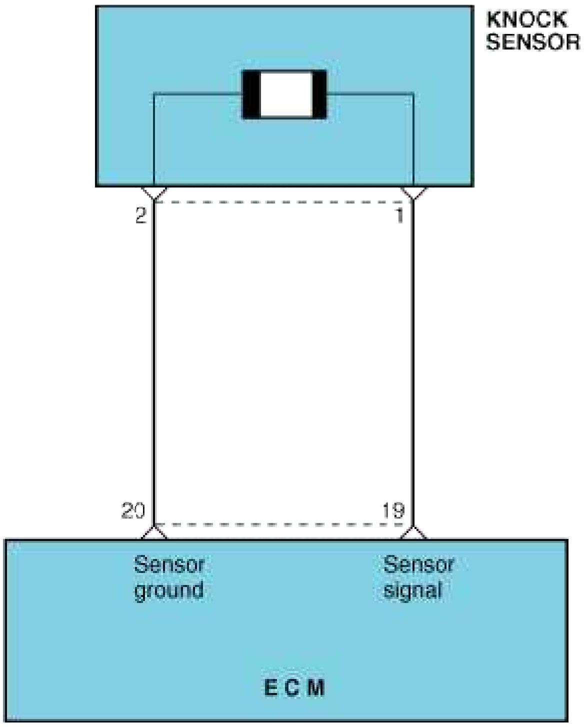
DESCRIPTION

The knock sensor is attached to the cylinder block and senses engine knocking. A knocking vibration from the cylinder block is applied as pressure to the sensor's piezoelectric element. This vibration pressure is then converted into a voltage signal. The Engine Control Module (ECM) uses this signal to suppress knocking by retarding ignition timing.

FAILURE CONDITIONS

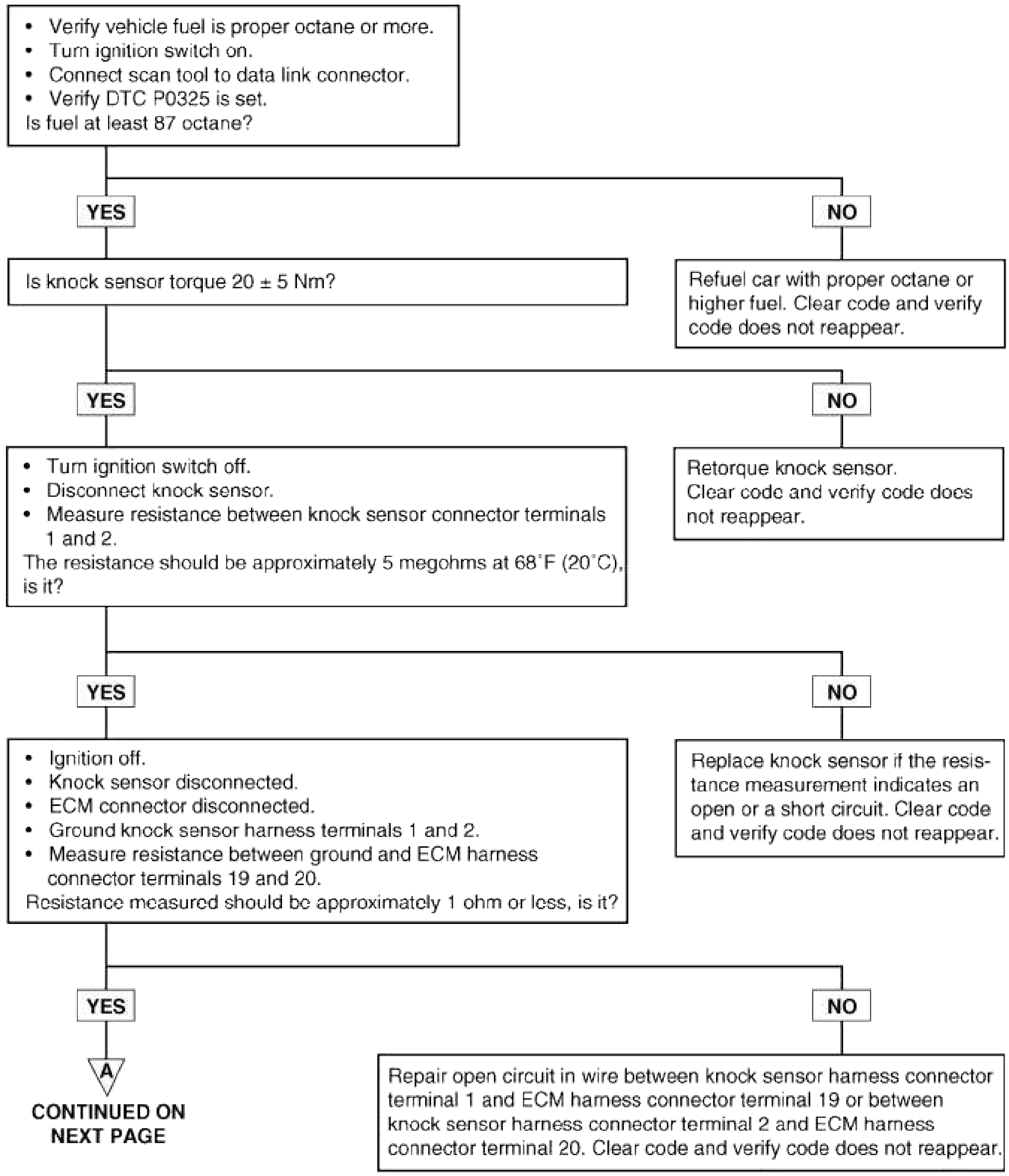
- Starter is not engaged.
- Engine speed is above 3000 RPM.
- Engine coolant temperature is above 104°F (40°C).
- Engine load is greater than 2.5 milliseconds.

CIRCUIT DIAGRAM


KNOCK SENSOR
2
1
20
19
Sensor ground
Sensor signal
E C M

Note : Refer to the appropriate
Electrical Troubleshooting
Manual for full wiring details.

TEST PROCEDURE



- Verify vehicle fuel is proper octane or more.
- Turn ignition switch on.
- Connect scan tool to data link connector.
- Verify DTC P0325 is set.

Is fuel at least 87 octane?

Is knock sensor torque 20 ± 5 Nm?

Refuel car with proper octane or higher fuel. Clear code and verify code does not reappear.

- Turn ignition switch off.
- Disconnect knock sensor.
- Measure resistance between knock sensor connector terminals 1 and 2.

The resistance should be approximately 5 megohms at 68°F (20°C), is it?

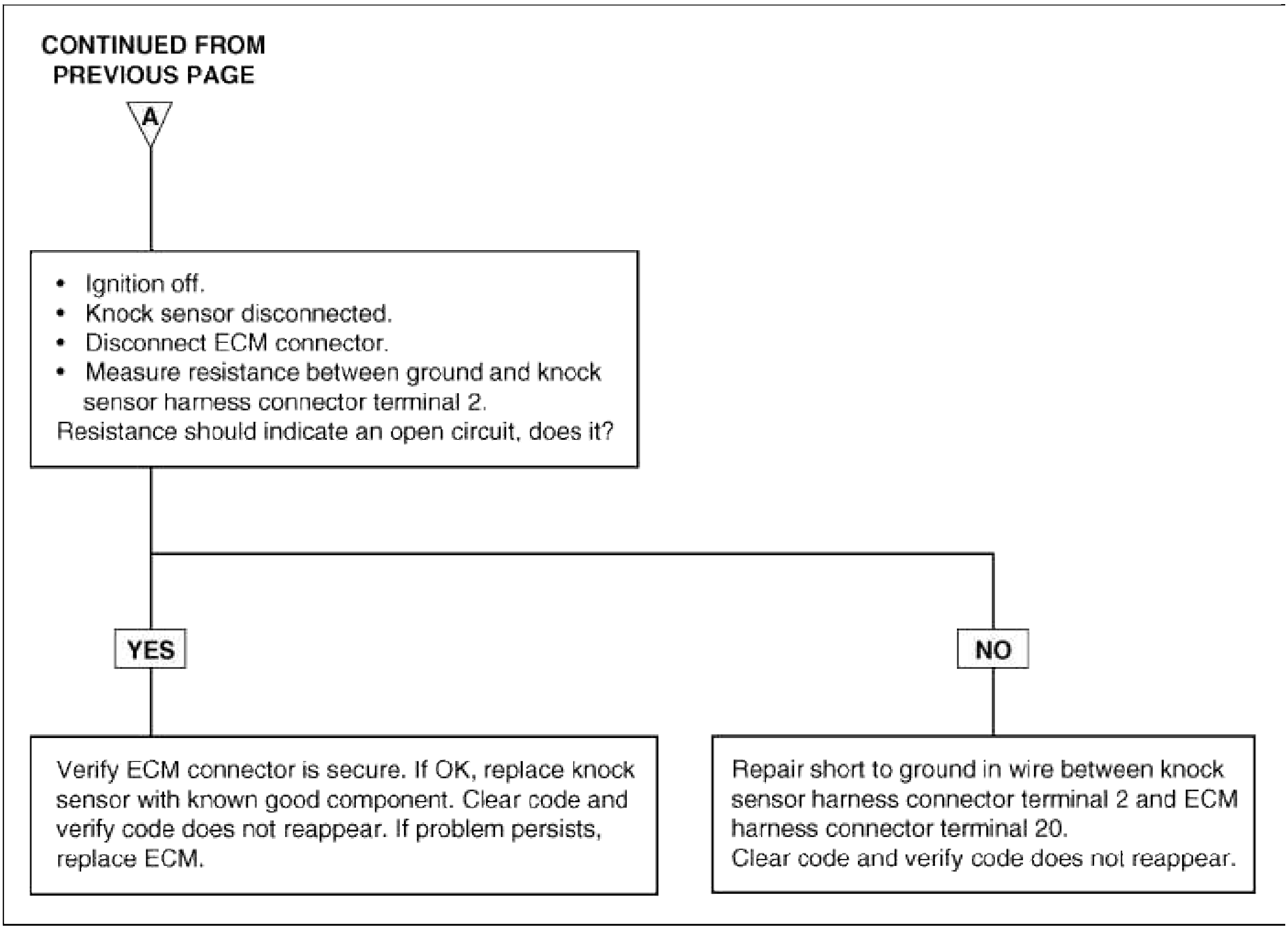
Retorque knock sensor. Clear code and verify code does not reappear.

- Ignition off.
- Knock sensor disconnected.
- ECM connector disconnected.
- Ground knock sensor harness terminals 1 and 2.
- Measure resistance between ground and ECM harness connector terminals 19 and 20.

Resistance measured should be approximately 1 ohm or less, is it?

Replace knock sensor if the resistance measurement indicates an open or a short circuit. Clear code and verify code does not reappear.

Repair open circuit in wire between knock sensor harness connector terminal 1 and ECM harness connector terminal 19 or between knock sensor harness connector terminal 2 and ECM harness connector terminal 20. Clear code and verify code does not reappear.



- Ignition off.
- Knock sensor disconnected.
- Disconnect ECM connector.
- Measure resistance between ground and knock sensor harness connector terminal 2.

Resistance should indicate an open circuit, does it?

Verify ECM connector is secure. If OK, replace knock sensor with known good component. Clear code and verify code does not reappear. If problem persists, replace ECM.

Repair short to ground in wire between knock sensor harness connector terminal 2 and ECM harness connector terminal 20. Clear code and verify code does not reappear.

Fuel System > Troubleshooting > P0335

[P0335/P0336]

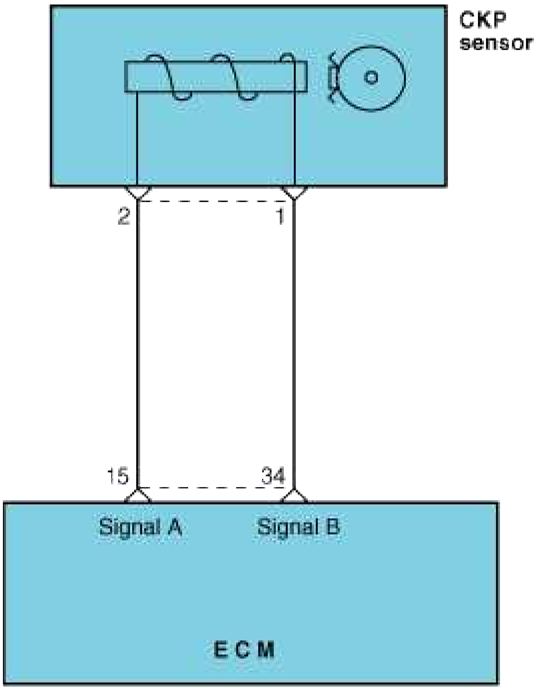
DTC	Diagnostic item
P0335 P0336	Crankshaft Position Sensor Circuit Malfunction Crankshaft Position Sensor Circuit Range/Performance

DESCRIPTION

The Crankshaft Position (CKP) sensor consists of a magnet and coil located next to the flywheel. The sensing wheel teeth are used by the CKP sensor to generate a signal. The voltage signal from CKP sensor allows the Engine Control Module (ECM) to determine engine RPM and crankshaft position.

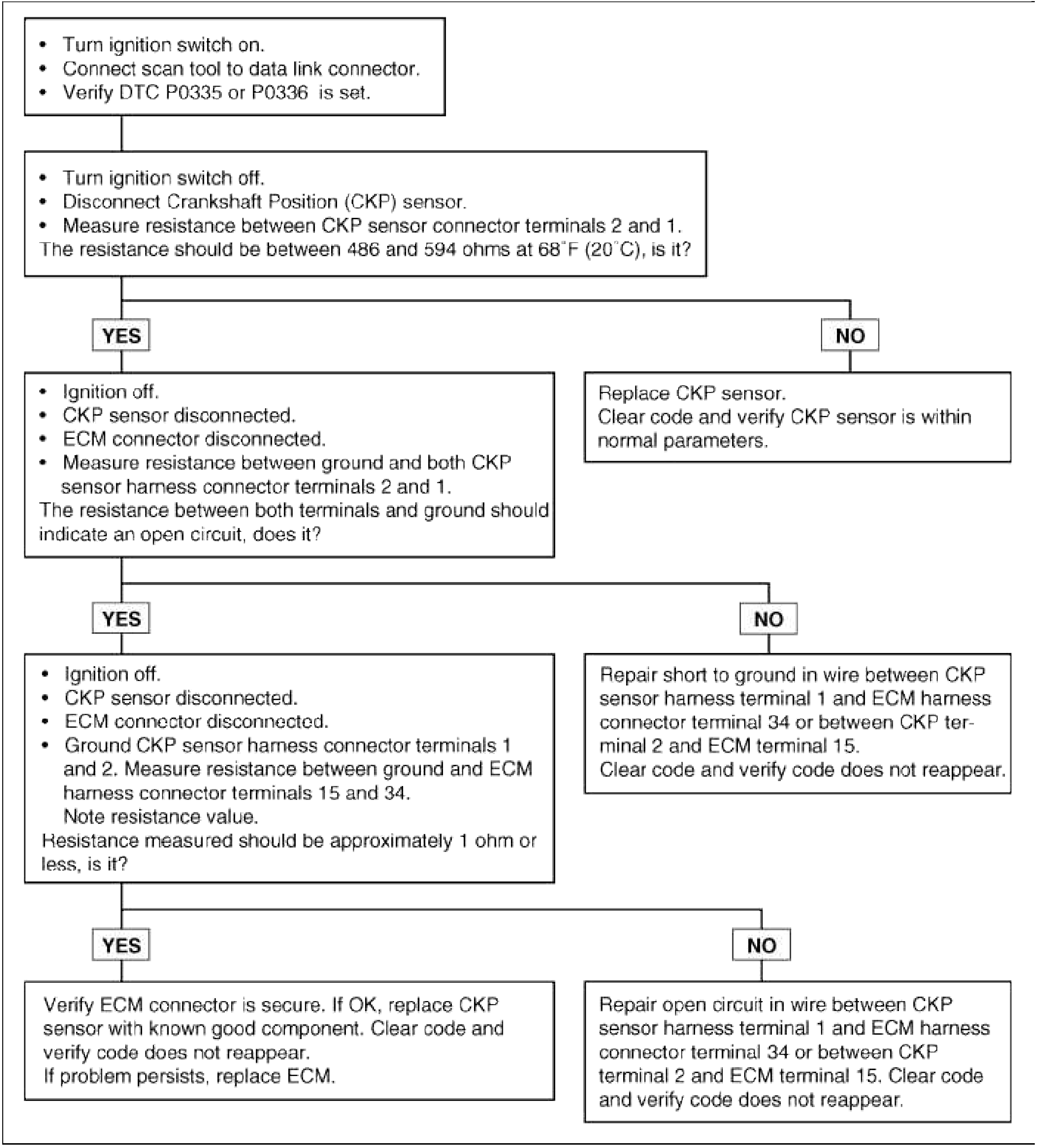
FAILURE CONDITIONS

CIRCUIT DIAGRAM


CKP
sensor
2
1
15
34
Signal A
Signal B
E C M

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn ignition switch on.
- Connect scan tool to data link connector.
- Verify DTC P0335 or P0336 is set.

- Turn ignition switch off.
- Disconnect Crankshaft Position (CKP) sensor.
- Measure resistance between CKP sensor connector terminals 2 and 1.

The resistance should be between 486 and 594 ohms at 68°F (20°C), is it?

YES

- Ignition off.
- CKP sensor disconnected.
- ECM connector disconnected.
- Measure resistance between ground and both CKP sensor harness connector terminals 2 and 1.

The resistance between both terminals and ground should indicate an open circuit, does it?

NO

Replace CKP sensor.
Clear code and verify CKP sensor is within normal parameters.

YES

- Ignition off.
- CKP sensor disconnected.
- ECM connector disconnected.
- Ground CKP sensor harness connector terminals 1 and 2. Measure resistance between ground and ECM harness connector terminals 15 and 34.
  Note resistance value.

Resistance measured should be approximately 1 ohm or less, is it?

NO

Repair short to ground in wire between CKP sensor harness terminal 1 and ECM harness connector terminal 34 or between CKP terminal 2 and ECM terminal 15.
Clear code and verify code does not reappear.

YES

Verify ECM connector is secure. If OK, replace CKP sensor with known good component. Clear code and verify code does not reappear.
If problem persists, replace ECM.

NO

Repair open circuit in wire between CKP sensor harness terminal 1 and ECM harness connector terminal 34 or between CKP terminal 2 and ECM terminal 15. Clear code and verify code does not reappear.

Fuel System > Troubleshooting > P0336

[P0335/P0336]

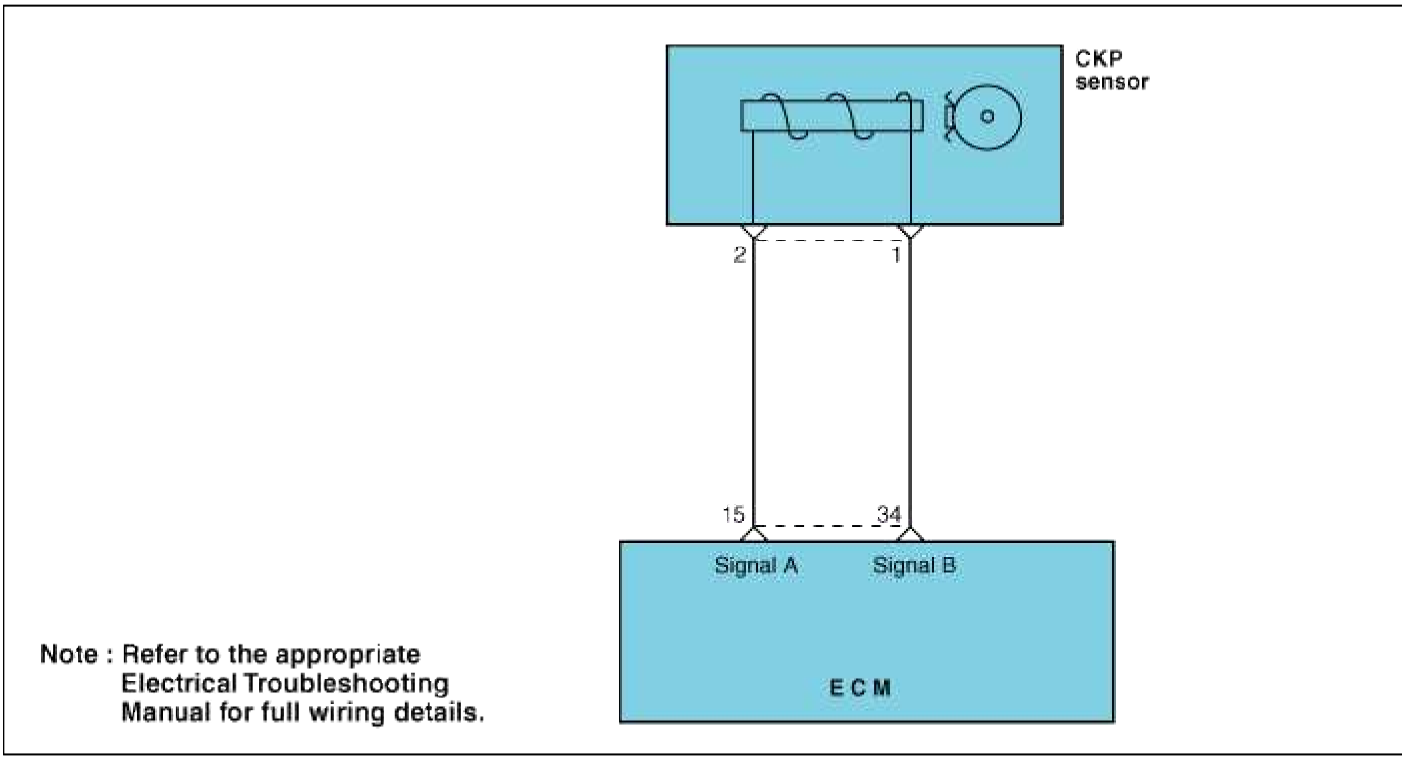
DTC	Diagnostic item
P0335 P0336	Crankshaft Position Sensor Circuit Malfunction Crankshaft Position Sensor Circuit Range/Performance

DESCRIPTION

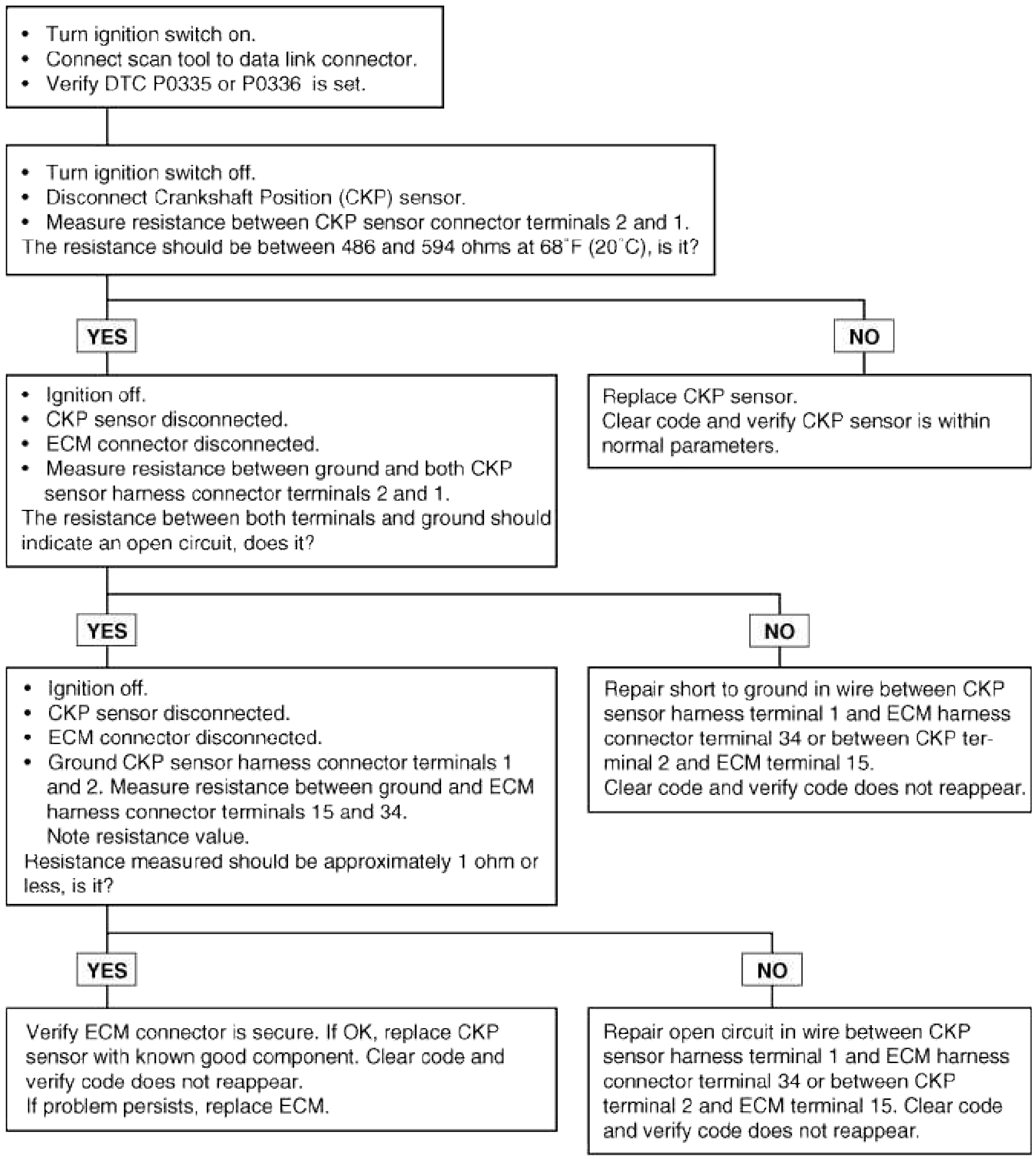
The Crankshaft Position (CKP) sensor consists of a magnet and coil located next to the flywheel. The sensing wheel teeth are used by the CKP sensor to generate a signal. The voltage signal from CKP sensor allows the Engine Control Module (ECM) to determine engine RPM and crankshaft position.

FAILURE CONDITIONS

CIRCUIT DIAGRAM


CKP sensor
2
1
15
34
Signal A
Signal B
E C M
Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn ignition switch on.
- Connect scan tool to data link connector.
- Verify DTC P0335 or P0336 is set.

- Turn ignition switch off.
- Disconnect Crankshaft Position (CKP) sensor.
- Measure resistance between CKP sensor connector terminals 2 and 1.

The resistance should be between 486 and 594 ohms at 68°F (20°C), is it?

Replace CKP sensor.
Clear code and verify CKP sensor is within normal parameters.

- Ignition off.
- CKP sensor disconnected.
- ECM connector disconnected.
- Measure resistance between ground and both CKP sensor harness connector terminals 2 and 1.

The resistance between both terminals and ground should indicate an open circuit, does it?

Repair short to ground in wire between CKP sensor harness terminal 1 and ECM harness connector terminal 34 or between CKP terminal 2 and ECM terminal 15.
Clear code and verify code does not reappear.

- Ignition off.
- CKP sensor disconnected.
- ECM connector disconnected.
- Ground CKP sensor harness connector terminals 1 and 2. Measure resistance between ground and ECM harness connector terminals 15 and 34.
  Note resistance value.

Resistance measured should be approximately 1 ohm or less, is it?

Verify ECM connector is secure. If OK, replace CKP sensor with known good component. Clear code and verify code does not reappear.
If problem persists, replace ECM.

Repair open circuit in wire between CKP sensor harness terminal 1 and ECM harness connector terminal 34 or between CKP terminal 2 and ECM terminal 15. Clear code and verify code does not reappear.

Fuel System > Troubleshooting > P0340

[P0340]

DTC	Diagnostic item
P0340	Camshaft Position Sensor Circuit Malfunction

DESCRIPTION

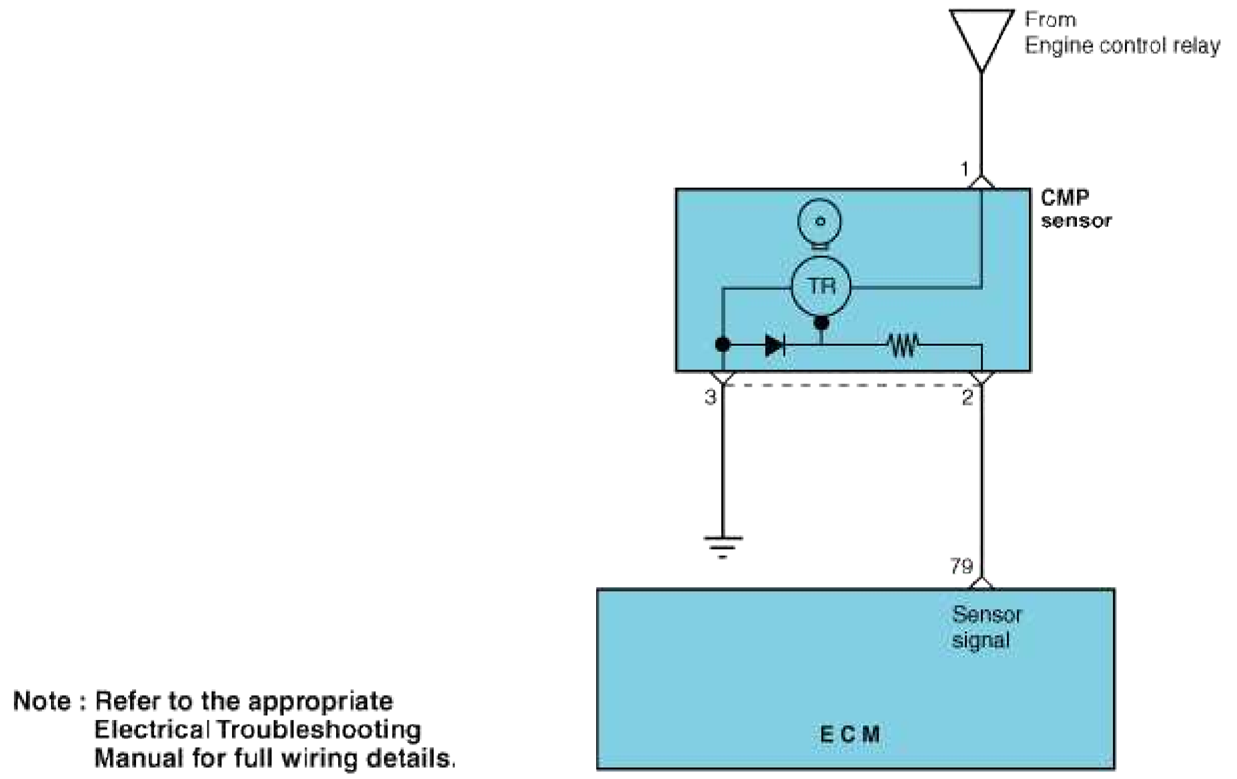
The Camshaft Position (CMP) sensor senses the Top Dead Center (TDC) point of the #1 cylinder in the compression stroke. The CMP sensor signal allows the Engine Control Module (ECM) to determine the fuel injector sequence starting point.

FAILURE CONDITIONS

The ECM will set P0340 and the Malfunction Indicator Lamp (MIL) will turn on if during two driving cycles there is more than one CMP sensor signal during two engine revolutions when the engine speed is above 600 RPM. This code indicates unexpected camshaft position readings by the CMP sensor or ECM when the engine is rotating.

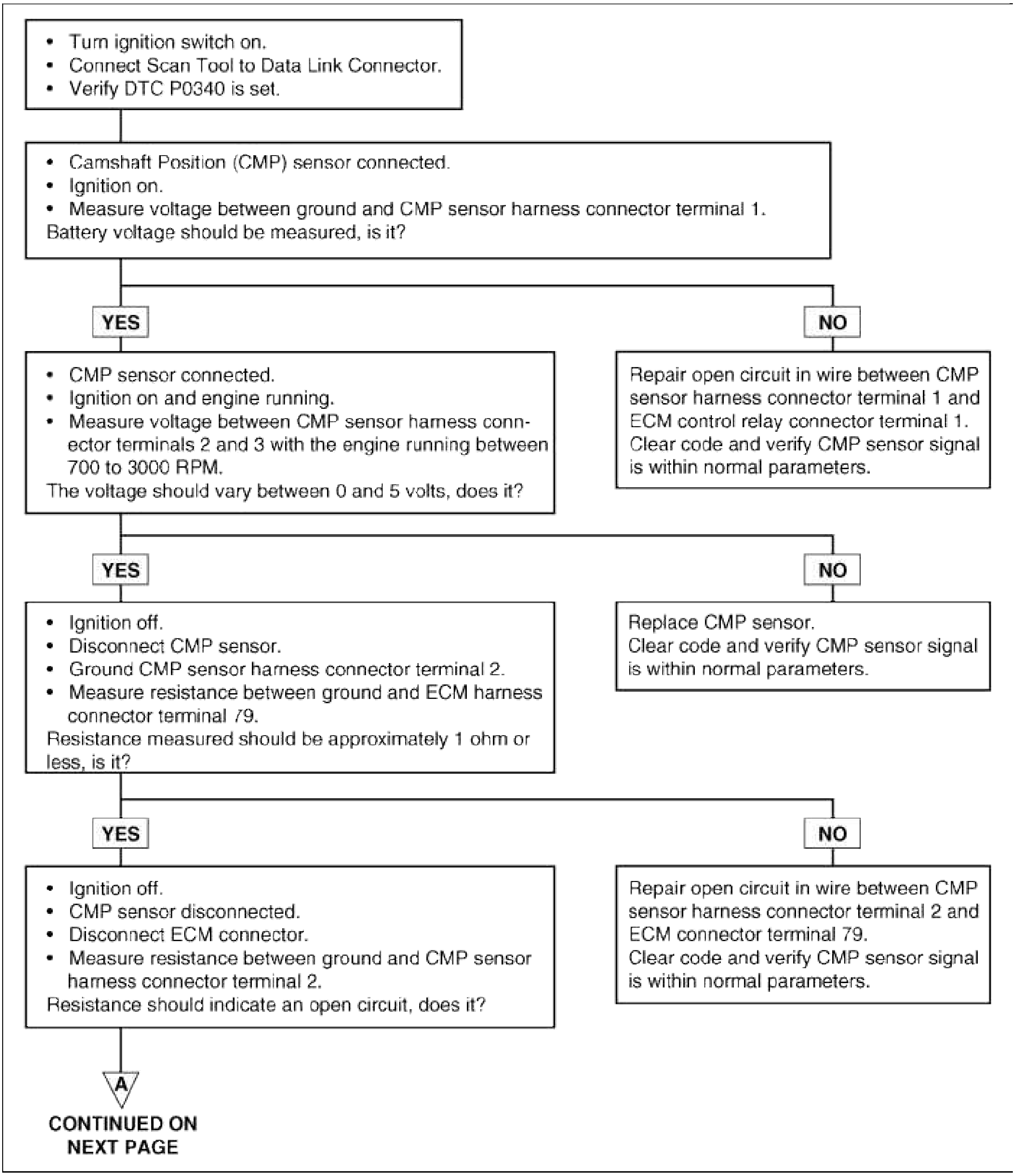
The ECM will also set P0340 and the Malfunction Indicator Lamp (MIL) will turn on if during two driving cycles there is no CMP sensor signal within 200 engine revolutions when the engine speed is above 600 RPM. This code indicates unexpected camshaft position readings by the CMP sensor or ECM when the engine is rotating.

CIRCUIT DIAGRAM



Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn ignition switch on.
- Connect Scan Tool to Data Link Connector.
- Verify DTC P0340 is set.

- Camshaft Position (CMP) sensor connected.
- Ignition on.
- Measure voltage between ground and CMP sensor harness connector terminal 1.

Battery voltage should be measured, is it?

- CMP sensor connected.
- Ignition on and engine running.
- Measure voltage between CMP sensor harness connector terminals 2 and 3 with the engine running between 700 to 3000 RPM.

The voltage should vary between 0 and 5 volts, does it?

Repair open circuit in wire between CMP sensor harness connector terminal 1 and ECM control relay connector terminal 1.
Clear code and verify CMP sensor signal is within normal parameters.

- Ignition off.
- Disconnect CMP sensor.
- Ground CMP sensor harness connector terminal 2.
- Measure resistance between ground and ECM harness connector terminal 79.

Resistance measured should be approximately 1 ohm or less, is it?

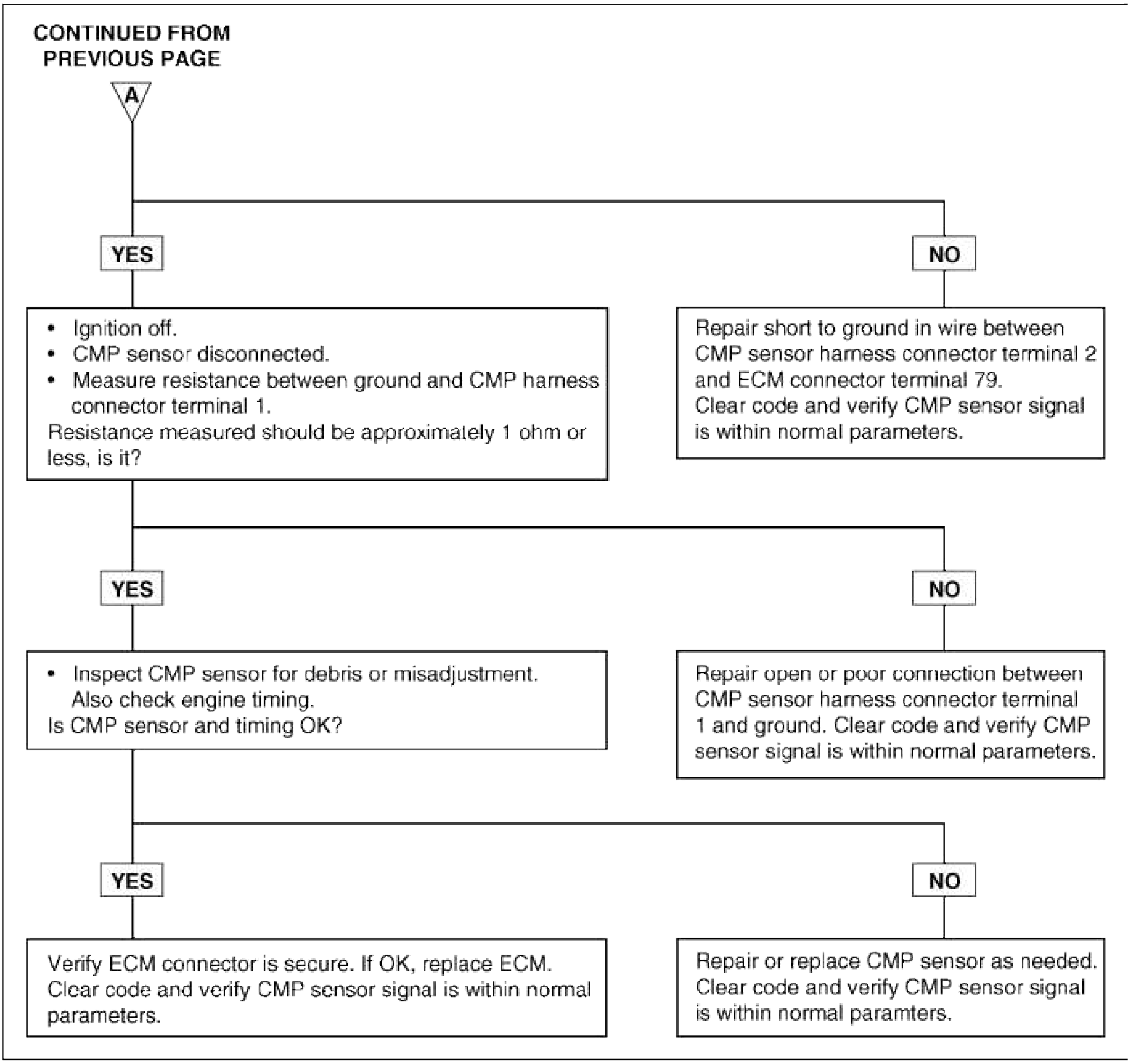
Replace CMP sensor.
Clear code and verify CMP sensor signal is within normal parameters.

- Ignition off.
- CMP sensor disconnected.
- Disconnect ECM connector.
- Measure resistance between ground and CMP sensor harness connector terminal 2.

Resistance should indicate an open circuit, does it?

Repair open circuit in wire between CMP sensor harness connector terminal 2 and ECM connector terminal 79.
Clear code and verify CMP sensor signal is within normal parameters.

CONTINUED ON
NEXT PAGE



- Ignition off.
- CMP sensor disconnected.
- Measure resistance between ground and CMP harness connector terminal 1.

Resistance measured should be approximately 1 ohm or less, is it?

Repair short to ground in wire between CMP sensor harness connector terminal 2 and ECM connector terminal 79. Clear code and verify CMP sensor signal is within normal parameters.

- Inspect CMP sensor for debris or misadjustment. Also check engine timing.

Is CMP sensor and timing OK?

Repair open or poor connection between CMP sensor harness connector terminal 1 and ground. Clear code and verify CMP sensor signal is within normal parameters.

Verify ECM connector is secure. If OK, replace ECM. Clear code and verify CMP sensor signal is within normal parameters.

Repair or replace CMP sensor as needed. Clear code and verify CMP sensor signal is within normal paramters.

Fuel System > Troubleshooting > P0506

[P0506/P0507]

DTC	Diagnostic item
P0506 P0507	Idle Control System - RPM Lower Than Expected Idle Control System - Idle RPM Higher Than Expected

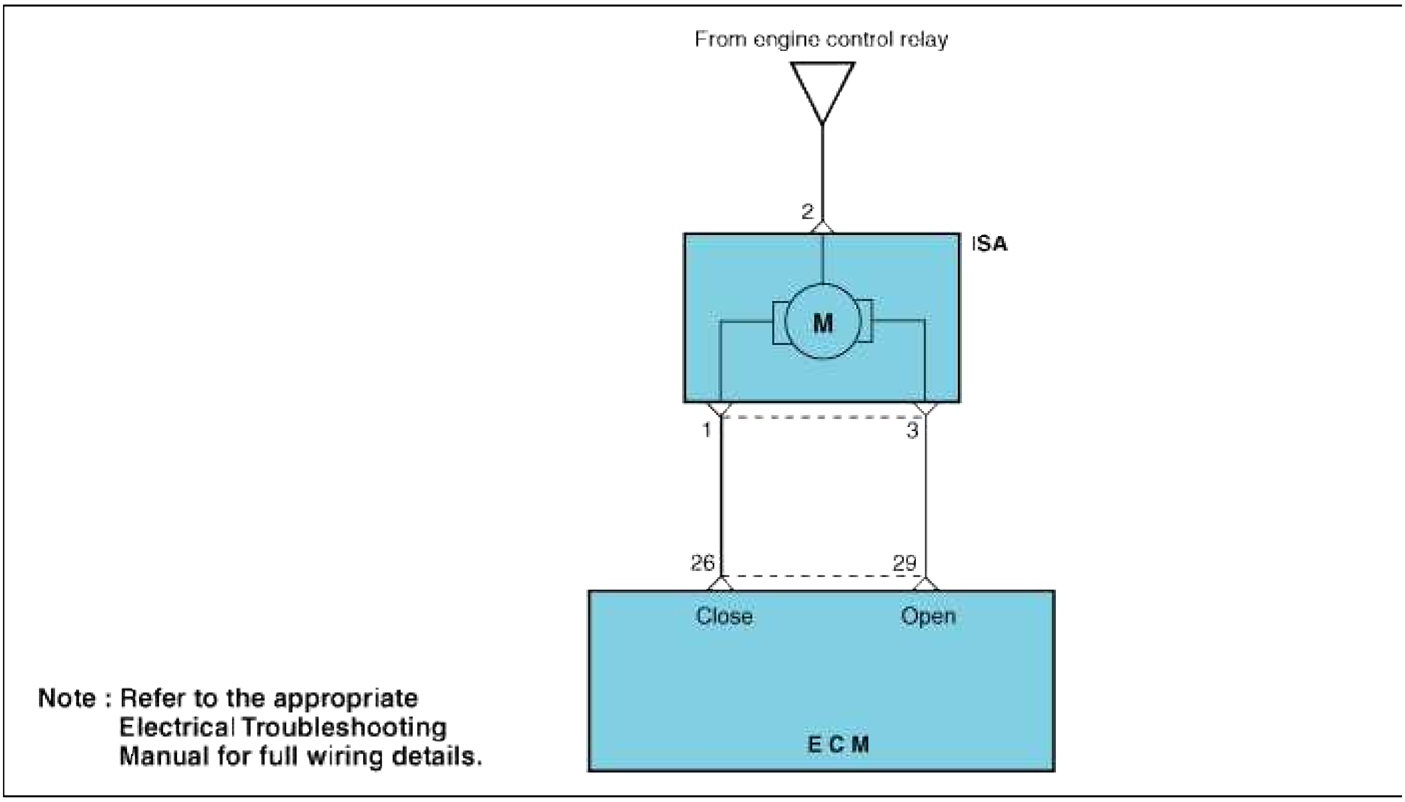
DESCRIPTION

The Idle Speed Control (ISC) actuator has two coils that are driven by separate ECM driver stages. Depending on the pulse duty factor, the equilibrium of the magnetic forces of the two coils will result in different directions for the magnetic forces of the two coils. This will result in different positions for the actuator. In parallel to the throttle valve, a bypass hose line is arranged where the ISC actuator is inserted.

FAILURE CONDITIONS

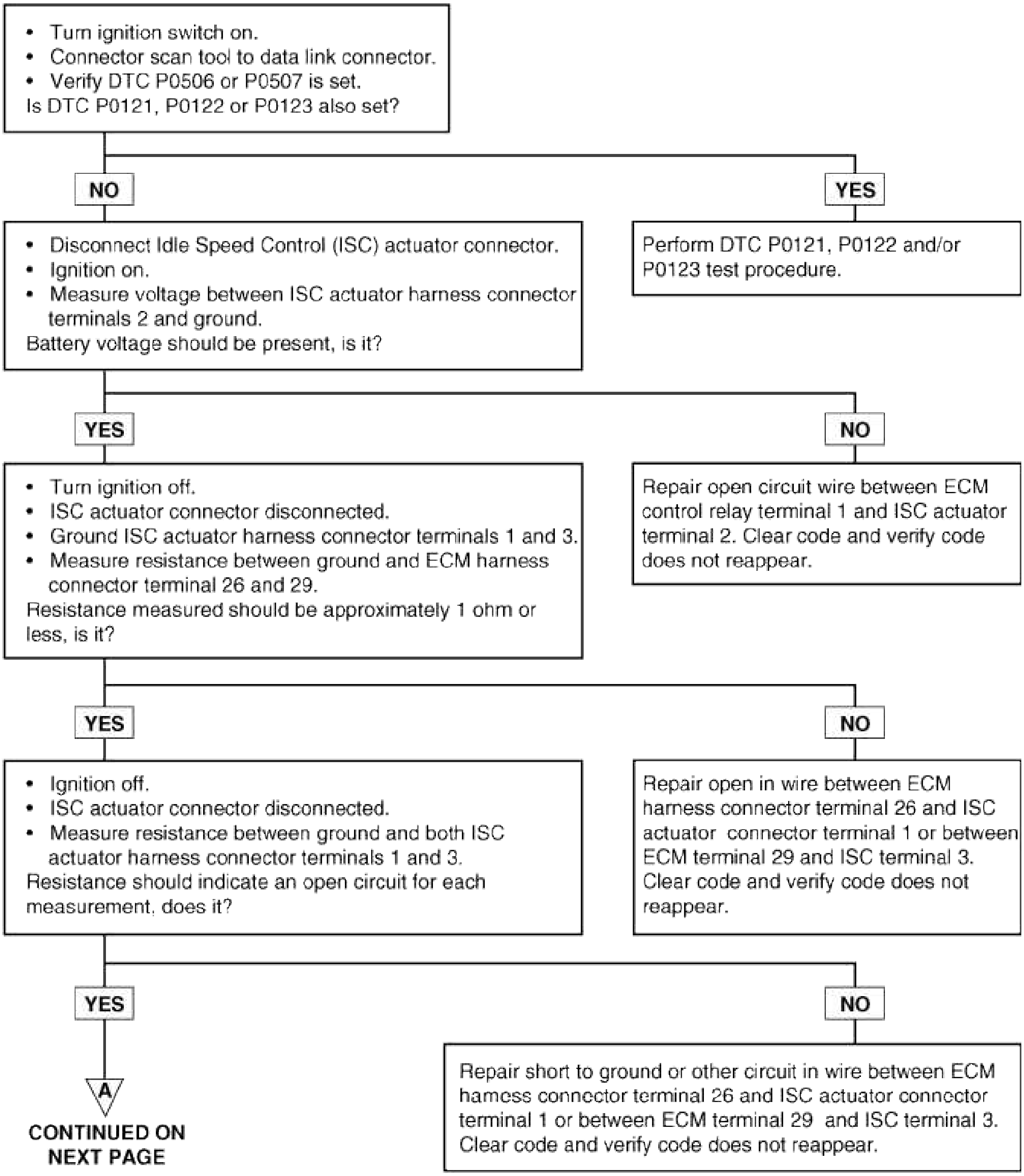
- The ISC actuator passes idle air at a rate above 4.1 g/s. [for P0506] or 1.7g/s [for P0507].
- Engine speed deviation is below 200 RPM.
- Vehicle speed is zero.
- Engine coolant temperature is above 167°F (75°C).

CIRCUIT DIAGRAM


From engine control relay
2
ISA
M
1
3
26
29
Close
Open
E C M

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn ignition switch on.
- Connector scan tool to data link connector.
- Verify DTC P0506 or P0507 is set.

Is DTC P0121, P0122 or P0123 also set?

NO

- Disconnect Idle Speed Control (ISC) actuator connector.
- Ignition on.
- Measure voltage between ISC actuator harness connector terminals 2 and ground.

Battery voltage should be present, is it?

YES

Perform DTC P0121, P0122 and/or P0123 test procedure.

YES

- Turn ignition off.
- ISC actuator connector disconnected.
- Ground ISC actuator harness connector terminals 1 and 3.
- Measure resistance between ground and ECM harness connector terminal 26 and 29.

Resistance measured should be approximately 1 ohm or less, is it?

NO

Repair open circuit wire between ECM control relay terminal 1 and ISC actuator terminal 2. Clear code and verify code does not reappear.

YES

- Ignition off.
- ISC actuator connector disconnected.
- Measure resistance between ground and both ISC actuator harness connector terminals 1 and 3.

Resistance should indicate an open circuit for each measurement, does it?

NO

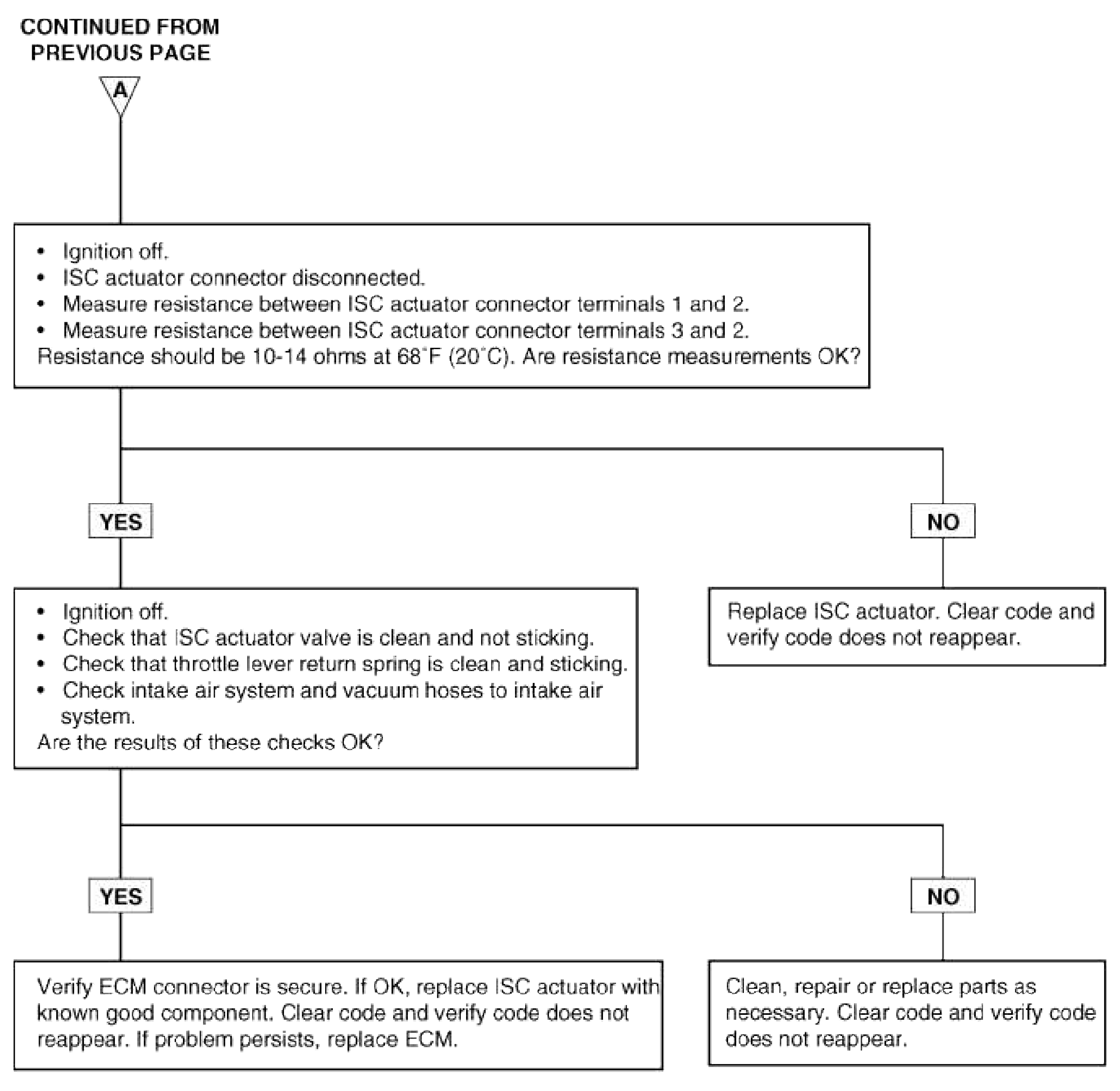
Repair open in wire between ECM harness connector terminal 26 and ISC actuator connector terminal 1 or between ECM terminal 29 and ISC terminal 3. Clear code and verify code does not reappear.

YES

A
CONTINUED ON NEXT PAGE

NO

Repair short to ground or other circuit in wire between ECM harness connector terminal 26 and ISC actuator connector terminal 1 or between ECM terminal 29 and ISC terminal 3. Clear code and verify code does not reappear.



CONTINUED FROM PREVIOUS PAGE

- Ignition off.
- ISC actuator connector disconnected.
- Measure resistance between ISC actuator connector terminals 1 and 2.
- Measure resistance between ISC actuator connector terminals 3 and 2.

Resistance should be 10-14 ohms at 68°F (20°C). Are resistance measurements OK?

- Ignition off.
- Check that ISC actuator valve is clean and not sticking.
- Check that throttle lever return spring is clean and sticking.
- Check intake air system and vacuum hoses to intake air system.

Are the results of these checks OK?

Replace ISC actuator. Clear code and verify code does not reappear.

Verify ECM connector is secure. If OK, replace ISC actuator with known good component. Clear code and verify code does not reappear. If problem persists, replace ECM.

Clean, repair or replace parts as necessary. Clear code and verify code does not reappear.

Fuel System > Troubleshooting > P0507

[P0506/P0507]

DTC	Diagnostic item
P0506 P0507	Idle Control System - RPM Lower Than Expected Idle Control System - Idle RPM Higher Than Expected

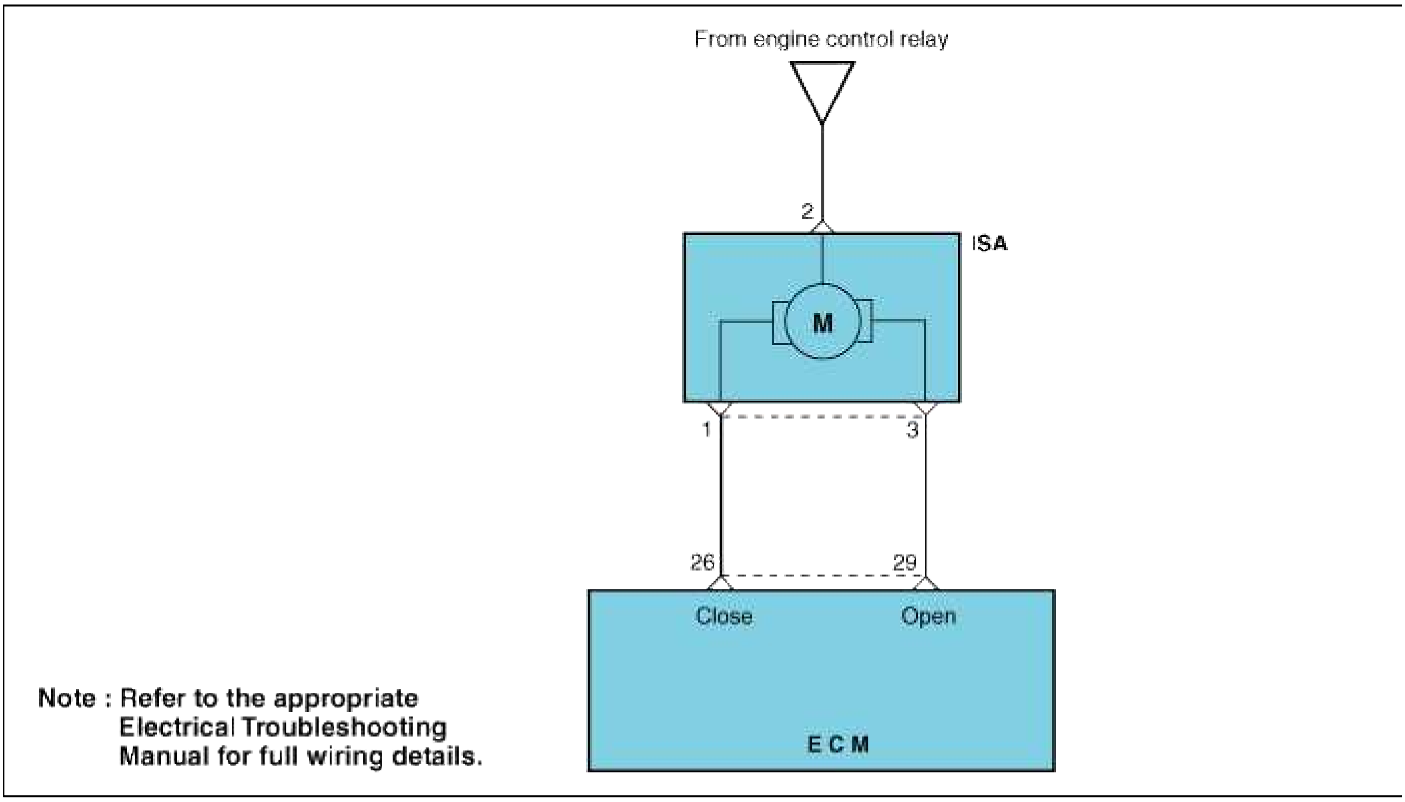
DESCRIPTION

The Idle Speed Control (ISC) actuator has two coils that are driven by separate ECM driver stages. Depending on the pulse duty factor, the equilibrium of the magnetic forces of the two coils will result in different directions for the magnetic forces of the two coils which will result in different positions for the actuator. In parallel to the throttle valve, a bypass hose line is arranged where the ISC actuator is inserted.

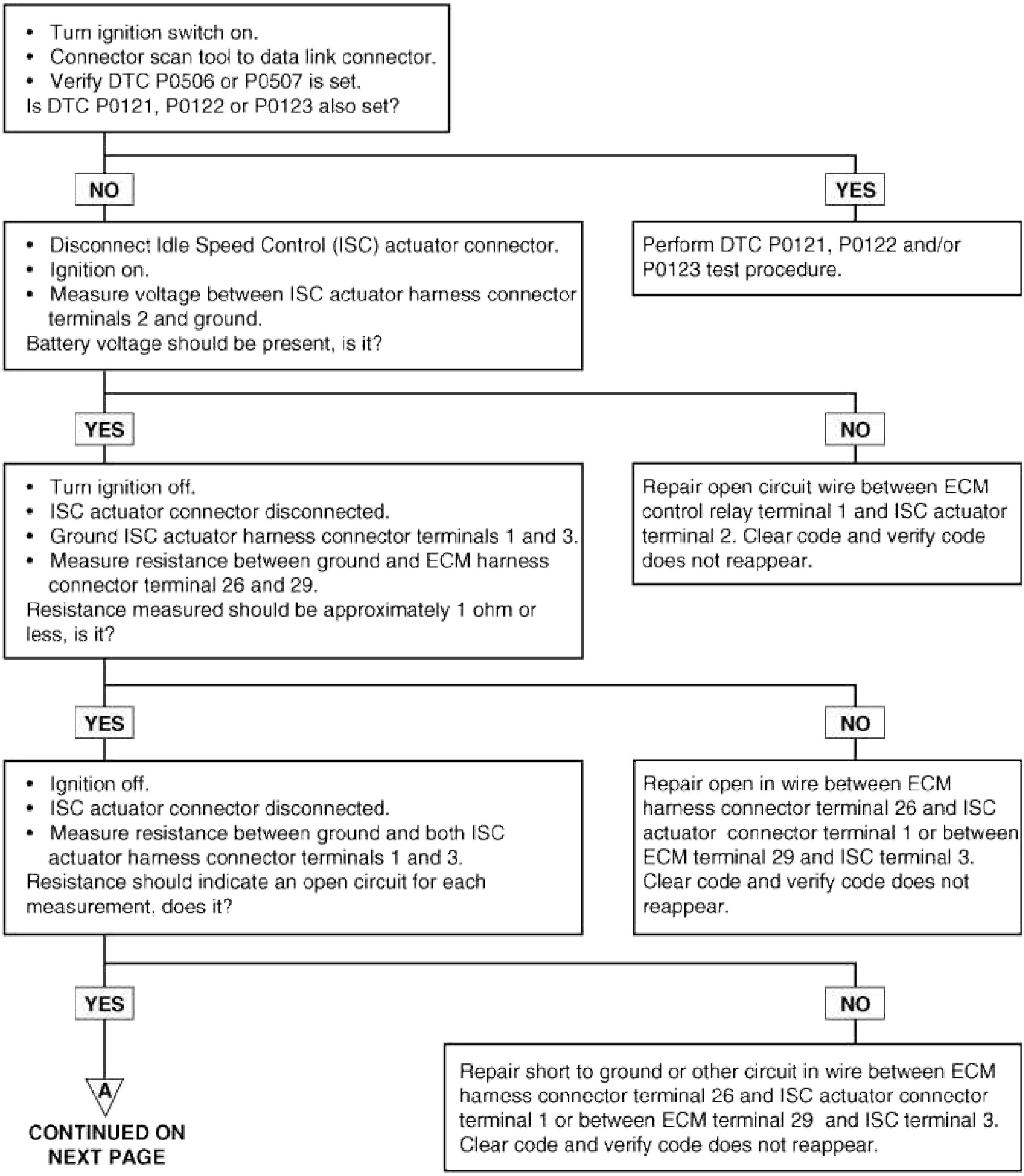
FAILURE CONDITIONS

- The ISC actuator passes idle air at a rate above 4.1 g/s. [for P0506] or 1.7g/s [for P0507].
- Engine speed deviation is below 200 RPM.
- Vehicle speed is zero.
- Engine coolant temperature is above 167°F (75°C).

CIRCUIT DIAGRAM


From engine control relay
2
ISA
M
1
3
26
29
Close
Open
E C M
Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn ignition switch on.
- Connector scan tool to data link connector.
- Verify DTC P0506 or P0507 is set.

Is DTC P0121, P0122 or P0123 also set?

NO

- Disconnect Idle Speed Control (ISC) actuator connector.
- Ignition on.
- Measure voltage between ISC actuator harness connector terminals 2 and ground.

Battery voltage should be present, is it?

YES

Perform DTC P0121, P0122 and/or P0123 test procedure.

YES

- Turn ignition off.
- ISC actuator connector disconnected.
- Ground ISC actuator harness connector terminals 1 and 3.
- Measure resistance between ground and ECM harness connector terminal 26 and 29.

Resistance measured should be approximately 1 ohm or less, is it?

NO

Repair open circuit wire between ECM control relay terminal 1 and ISC actuator terminal 2. Clear code and verify code does not reappear.

YES

- Ignition off.
- ISC actuator connector disconnected.
- Measure resistance between ground and both ISC actuator harness connector terminals 1 and 3.

Resistance should indicate an open circuit for each measurement, does it?

NO

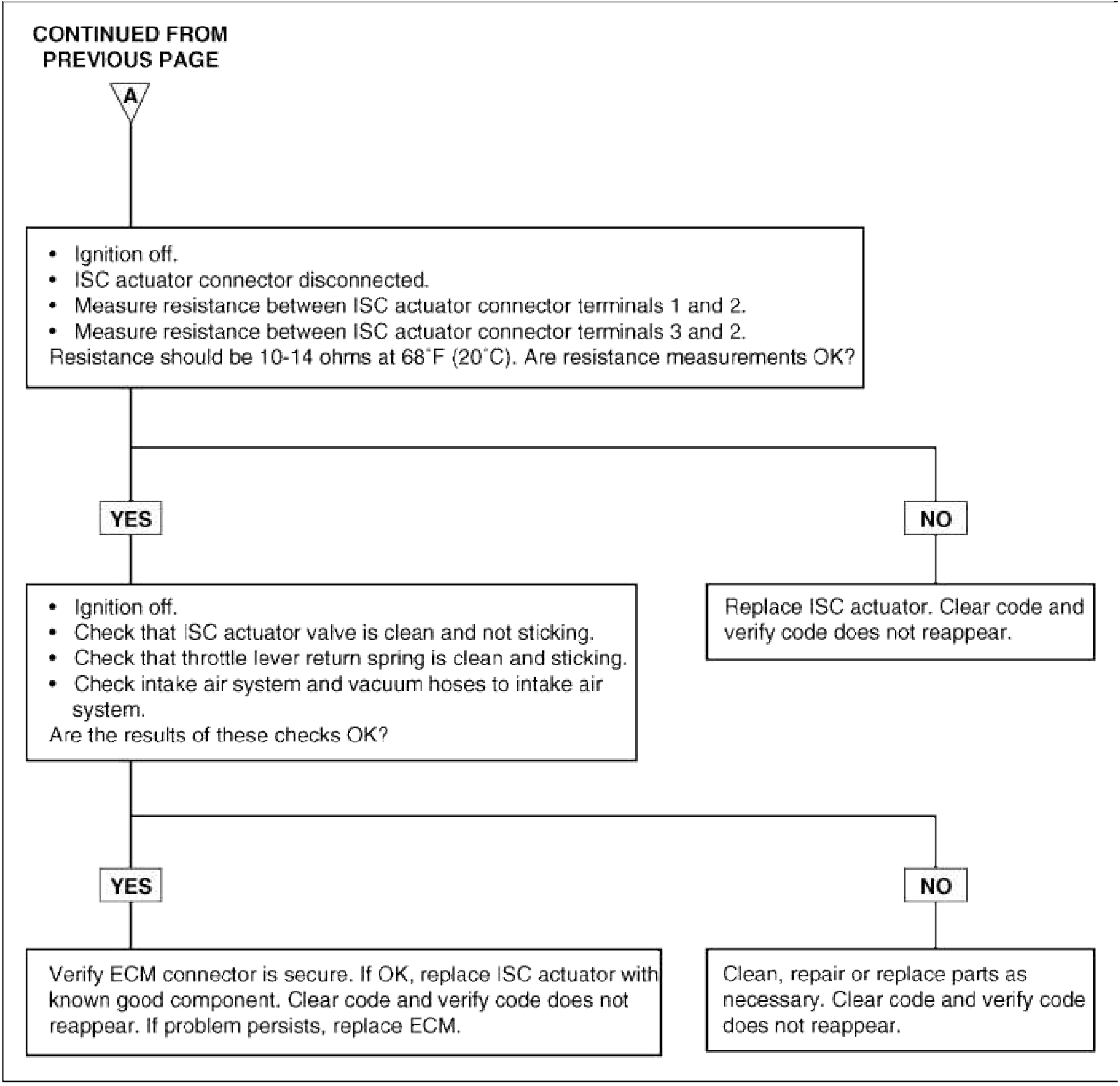
Repair open in wire between ECM harness connector terminal 26 and ISC actuator connector terminal 1 or between ECM terminal 29 and ISC terminal 3. Clear code and verify code does not reappear.

YES

CONTINUED ON NEXT PAGE

NO

Repair short to ground or other circuit in wire between ECM harness connector terminal 26 and ISC actuator connector terminal 1 or between ECM terminal 29 and ISC terminal 3. Clear code and verify code does not reappear.



- Ignition off.
- ISC actuator connector disconnected.
- Measure resistance between ISC actuator connector terminals 1 and 2.
- Measure resistance between ISC actuator connector terminals 3 and 2.

Resistance should be 10-14 ohms at 68°F (20°C). Are resistance measurements OK?

- Ignition off.
- Check that ISC actuator valve is clean and not sticking.
- Check that throttle lever return spring is clean and sticking.
- Check intake air system and vacuum hoses to intake air system.

Are the results of these checks OK?

Replace ISC actuator. Clear code and verify code does not reappear.

Verify ECM connector is secure. If OK, replace ISC actuator with known good component. Clear code and verify code does not reappear. If problem persists, replace ECM.

Clean, repair or replace parts as necessary. Clear code and verify code does not reappear.

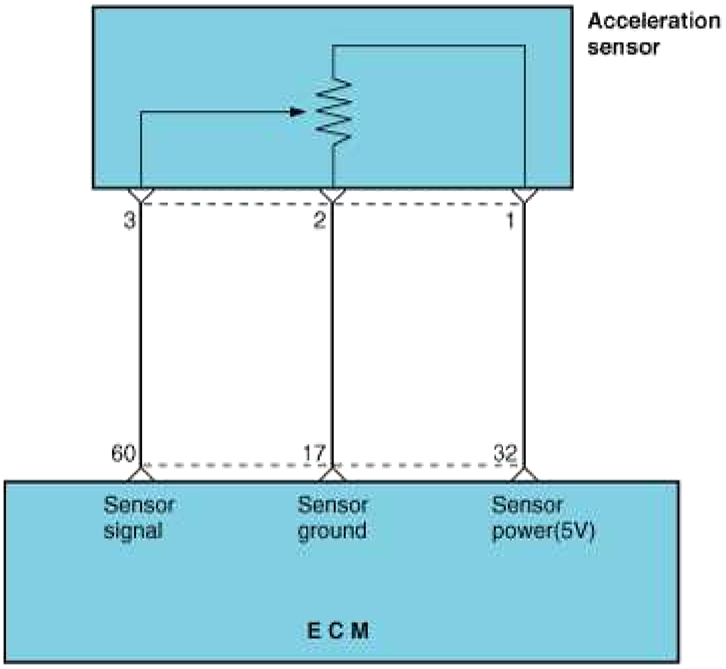
Fuel System > Troubleshooting > P1307

[P1307/P1308/P1309]

DTC	Diagnostic item
P1307 P1308 P1309	Acceleration Sensor Rationality Acceleration Sensor Signal Check Low Acceleration Sensor Signal Check High

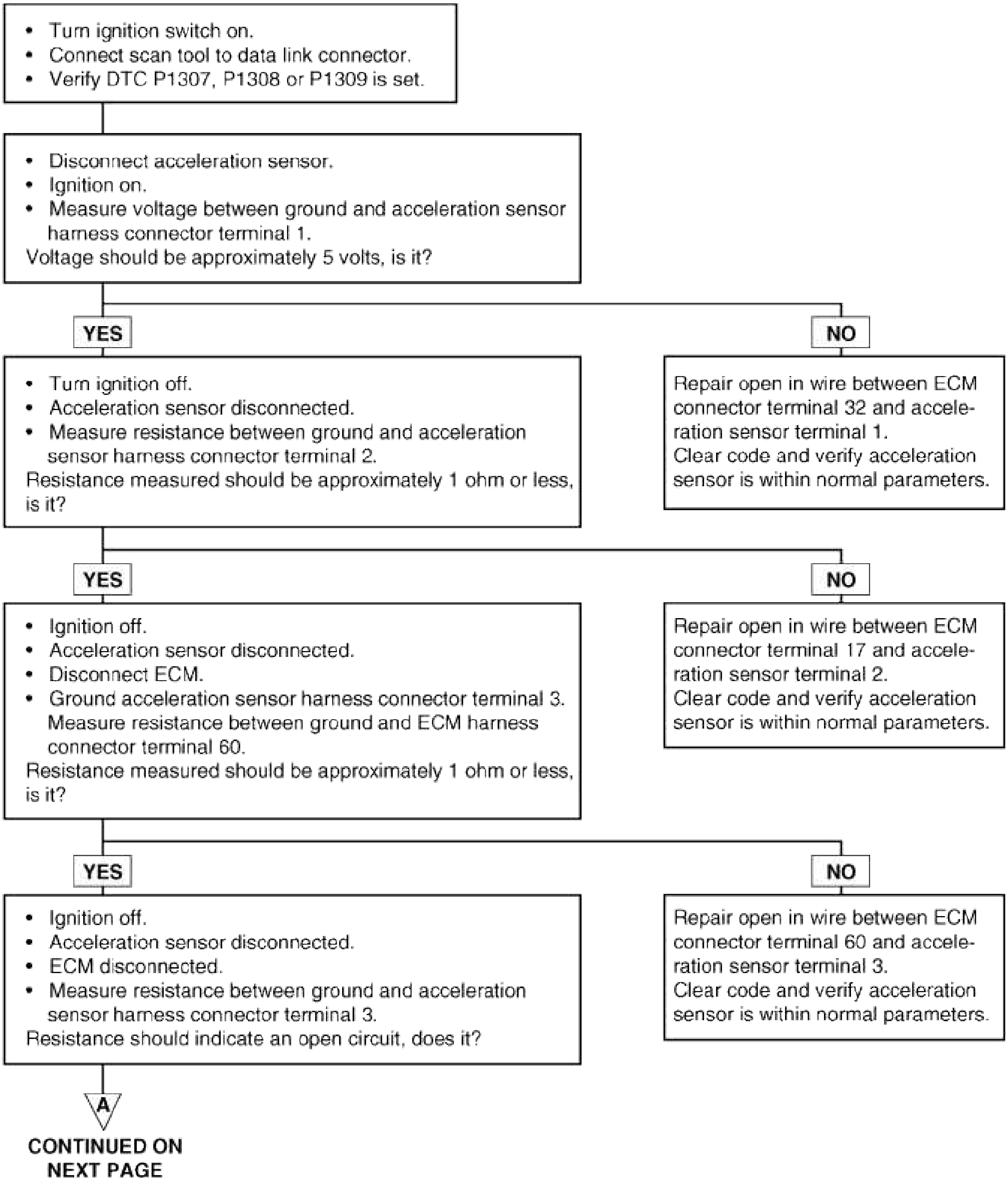
DESCRIPTION
The acceleration sensor is used to sense rough road conditions. The sensor's signal is used by the Engine Control Module (ECM) to prevent wrongful misfire detection.
FAILURE CONDITIONS

CIRCUIT DIAGRAM


Acceleration sensor
3
2
1
60
17
32
Sensor signal
Sensor ground
Sensor power(5V)
E C M

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn ignition switch on.
- Connect scan tool to data link connector.
- Verify DTC P1307, P1308 or P1309 is set.

- Disconnect acceleration sensor.
- Ignition on.
- Measure voltage between ground and acceleration sensor harness connector terminal 1.

Voltage should be approximately 5 volts, is it?

YES

- Turn ignition off.
- Acceleration sensor disconnected.
- Measure resistance between ground and acceleration sensor harness connector terminal 2.

Resistance measured should be approximately 1 ohm or less, is it?

NO

Repair open in wire between ECM connector terminal 32 and acceleration sensor terminal 1.
Clear code and verify acceleration sensor is within normal parameters.

YES

- Ignition off.
- Acceleration sensor disconnected.
- Disconnect ECM.
- Ground acceleration sensor harness connector terminal 3. Measure resistance between ground and ECM harness connector terminal 60.

Resistance measured should be approximately 1 ohm or less, is it?

NO

Repair open in wire between ECM connector terminal 17 and acceleration sensor terminal 2.
Clear code and verify acceleration sensor is within normal parameters.

YES

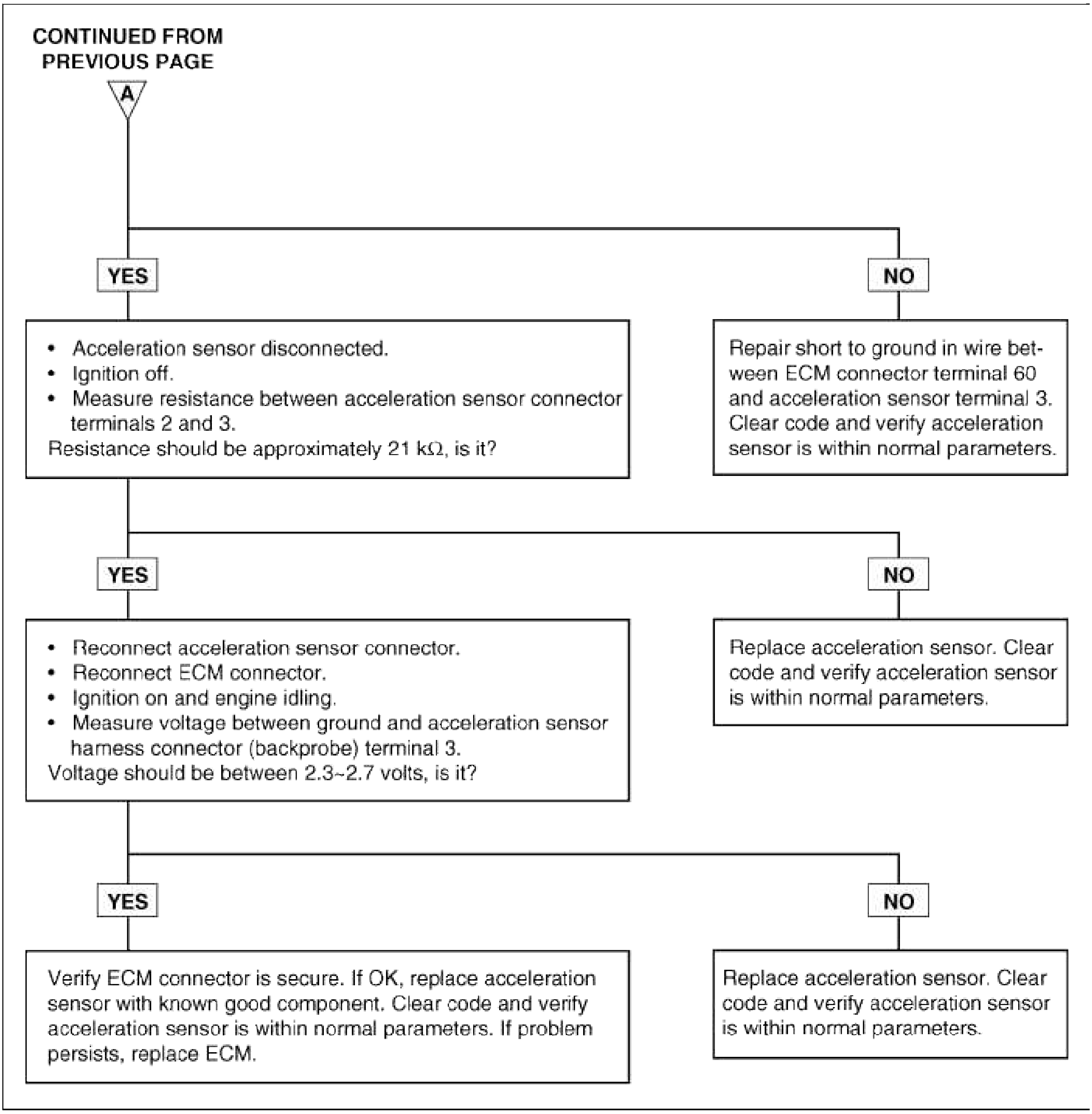
- Ignition off.
- Acceleration sensor disconnected.
- ECM disconnected.
- Measure resistance between ground and acceleration sensor harness connector terminal 3.

Resistance should indicate an open circuit, does it?

NO

Repair open in wire between ECM connector terminal 60 and acceleration sensor terminal 3.
Clear code and verify acceleration sensor is within normal parameters.

CONTINUED ON NEXT PAGE



- Acceleration sensor disconnected.
- Ignition off.
- Measure resistance between acceleration sensor connector terminals 2 and 3.

Resistance should be approximately 21 kΩ, is it?

Repair short to ground in wire between ECM connector terminal 60 and acceleration sensor terminal 3. Clear code and verify acceleration sensor is within normal parameters.

- Reconnect acceleration sensor connector.
- Reconnect ECM connector.
- Ignition on and engine idling.
- Measure voltage between ground and acceleration sensor harness connector (backprobe) terminal 3.

Voltage should be between 2.3~2.7 volts, is it?

Replace acceleration sensor. Clear code and verify acceleration sensor is within normal parameters.

Verify ECM connector is secure. If OK, replace acceleration sensor with known good component. Clear code and verify acceleration sensor is within normal parameters. If problem persists, replace ECM.

Replace acceleration sensor. Clear code and verify acceleration sensor is within normal parameters.

Fuel System > Troubleshooting > P1308

[P1307/P1308/P1309]

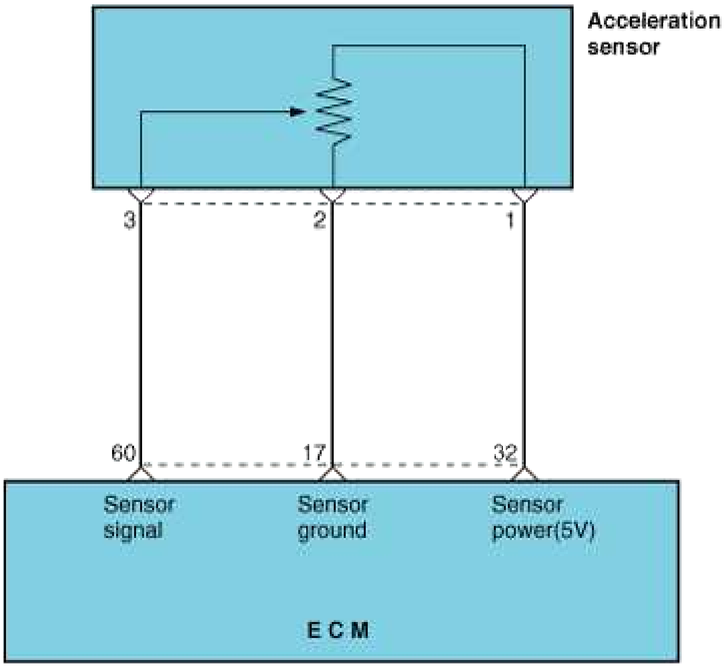
DTC	Diagnostic item
P1307 P1308 P1309	Acceleration Sensor Rationality Acceleration Sensor Signal Check Low Acceleration Sensor Signal Check High

DESCRIPTION

The acceleration sensor is used to sense rough road conditions. The sensor's signal is used by the Engine Control Module (ECM) to prevent wrongful misfire detection.

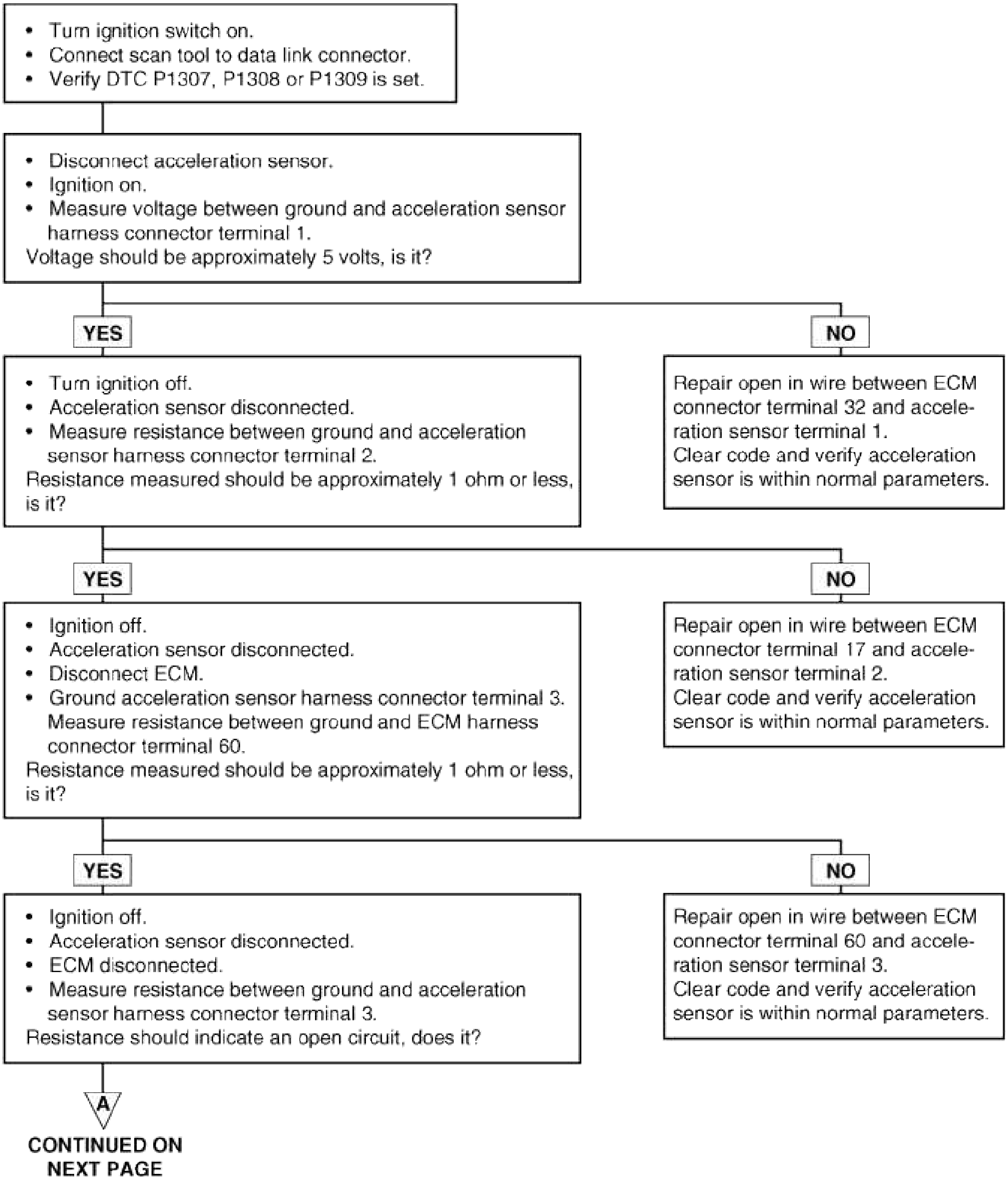
FAILURE CONDITIONS

CIRCUIT DIAGRAM


Acceleration sensor
3
2
1
60
17
32
Sensor signal
Sensor ground
Sensor power(5V)
E C M

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn ignition switch on.
- Connect scan tool to data link connector.
- Verify DTC P1307, P1308 or P1309 is set.

- Disconnect acceleration sensor.
- Ignition on.
- Measure voltage between ground and acceleration sensor harness connector terminal 1.

Voltage should be approximately 5 volts, is it?

YES

- Turn ignition off.
- Acceleration sensor disconnected.
- Measure resistance between ground and acceleration sensor harness connector terminal 2.

Resistance measured should be approximately 1 ohm or less, is it?

NO

Repair open in wire between ECM connector terminal 32 and acceleration sensor terminal 1.
Clear code and verify acceleration sensor is within normal parameters.

YES

- Ignition off.
- Acceleration sensor disconnected.
- Disconnect ECM.
- Ground acceleration sensor harness connector terminal 3. Measure resistance between ground and ECM harness connector terminal 60.

Resistance measured should be approximately 1 ohm or less, is it?

NO

Repair open in wire between ECM connector terminal 17 and acceleration sensor terminal 2.
Clear code and verify acceleration sensor is within normal parameters.

YES

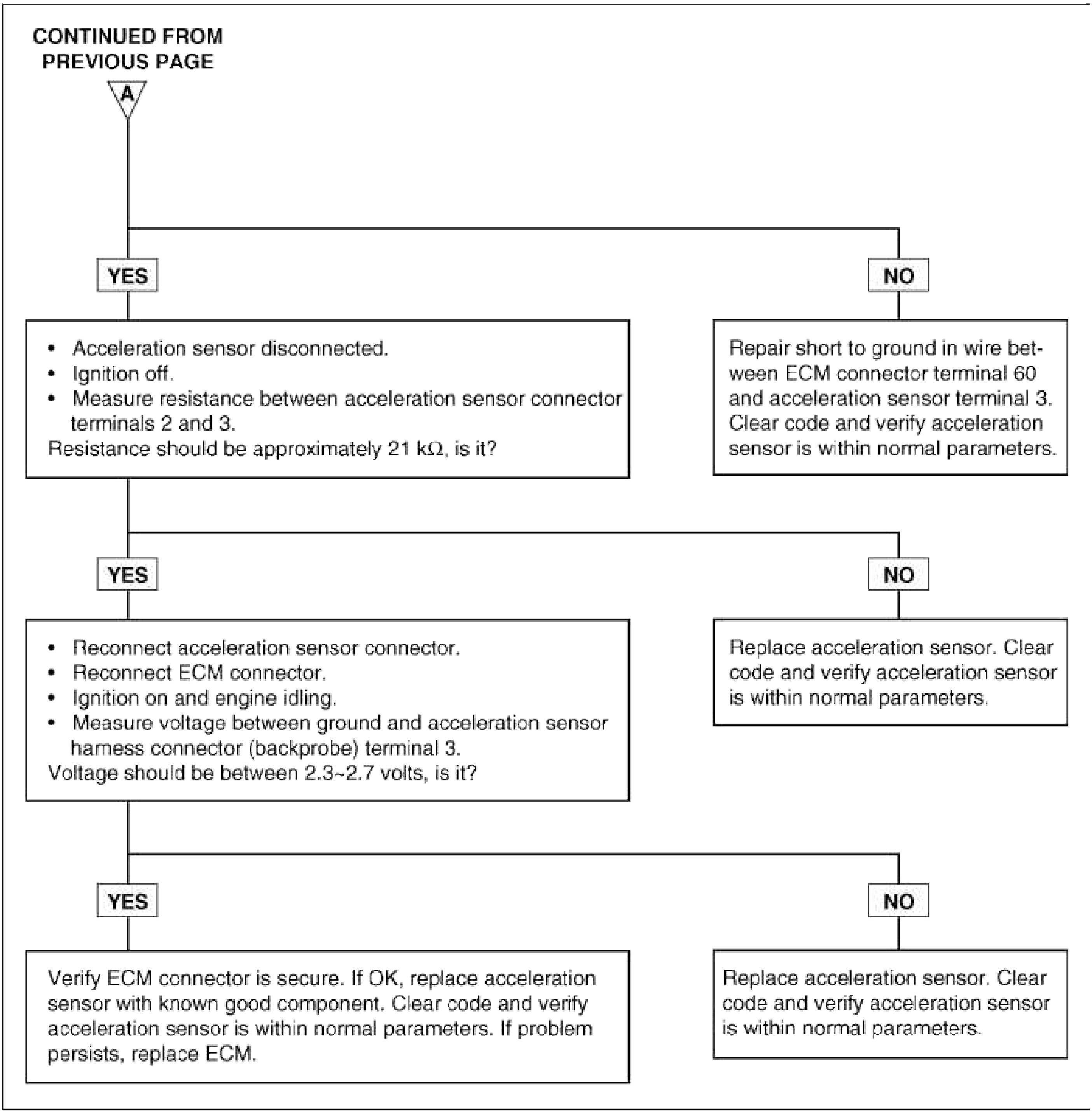
- Ignition off.
- Acceleration sensor disconnected.
- ECM disconnected.
- Measure resistance between ground and acceleration sensor harness connector terminal 3.

Resistance should indicate an open circuit, does it?

NO

Repair open in wire between ECM connector terminal 60 and acceleration sensor terminal 3.
Clear code and verify acceleration sensor is within normal parameters.

CONTINUED ON NEXT PAGE



- Acceleration sensor disconnected.
- Ignition off.
- Measure resistance between acceleration sensor connector terminals 2 and 3.

Resistance should be approximately 21 kΩ, is it?

Repair short to ground in wire between ECM connector terminal 60 and acceleration sensor terminal 3. Clear code and verify acceleration sensor is within normal parameters.

- Reconnect acceleration sensor connector.
- Reconnect ECM connector.
- Ignition on and engine idling.
- Measure voltage between ground and acceleration sensor harness connector (backprobe) terminal 3.

Voltage should be between 2.3~2.7 volts, is it?

Replace acceleration sensor. Clear code and verify acceleration sensor is within normal parameters.

Verify ECM connector is secure. If OK, replace acceleration sensor with known good component. Clear code and verify acceleration sensor is within normal parameters. If problem persists, replace ECM.

Replace acceleration sensor. Clear code and verify acceleration sensor is within normal parameters.

Fuel System > Troubleshooting > P1309

[P1307/P1308/P1309]

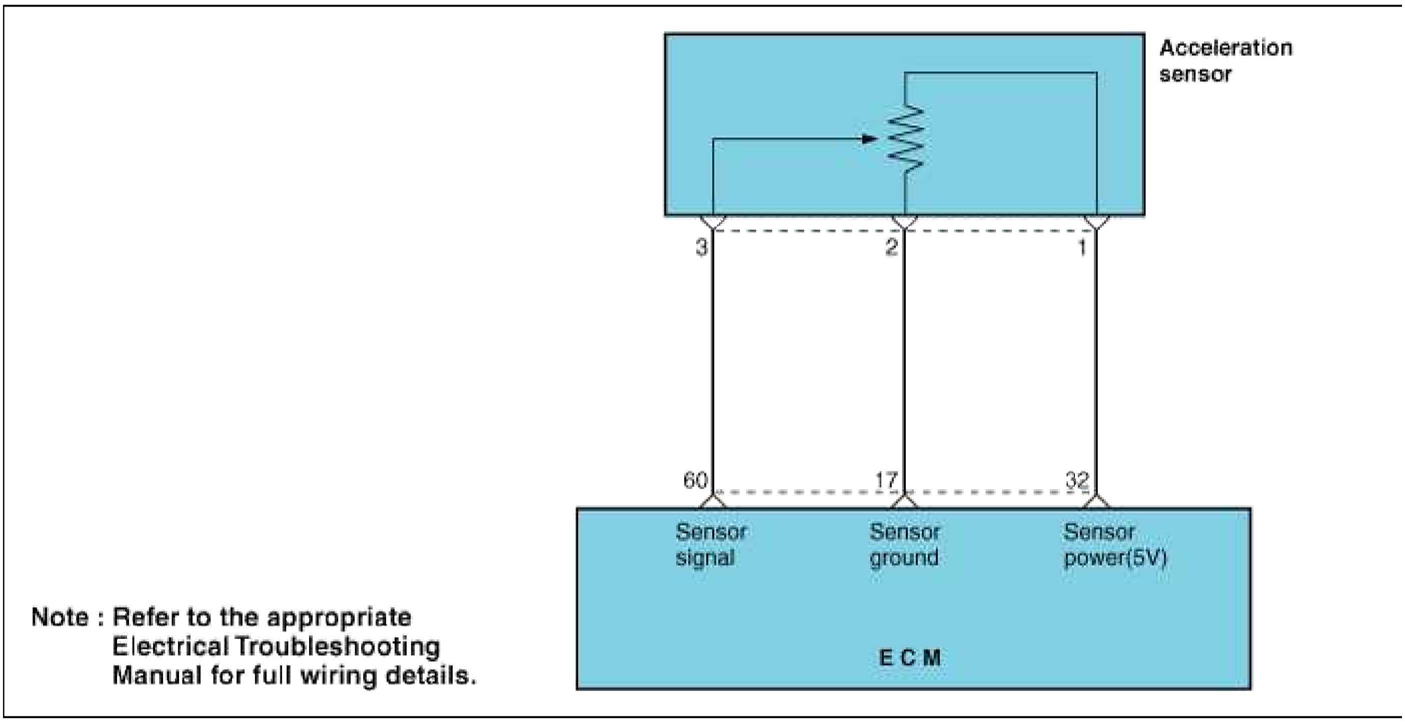
DTC	Diagnostic item
P1307 P1308 P1309	Acceleration Sensor Rationality Acceleration Sensor Signal Check Low Acceleration Sensor Signal Check High

DESCRIPTION

The acceleration sensor is used to sense rough road conditions. The sensor's signal is used by the Engine Control Module (ECM) to prevent wrongful misfire detection.

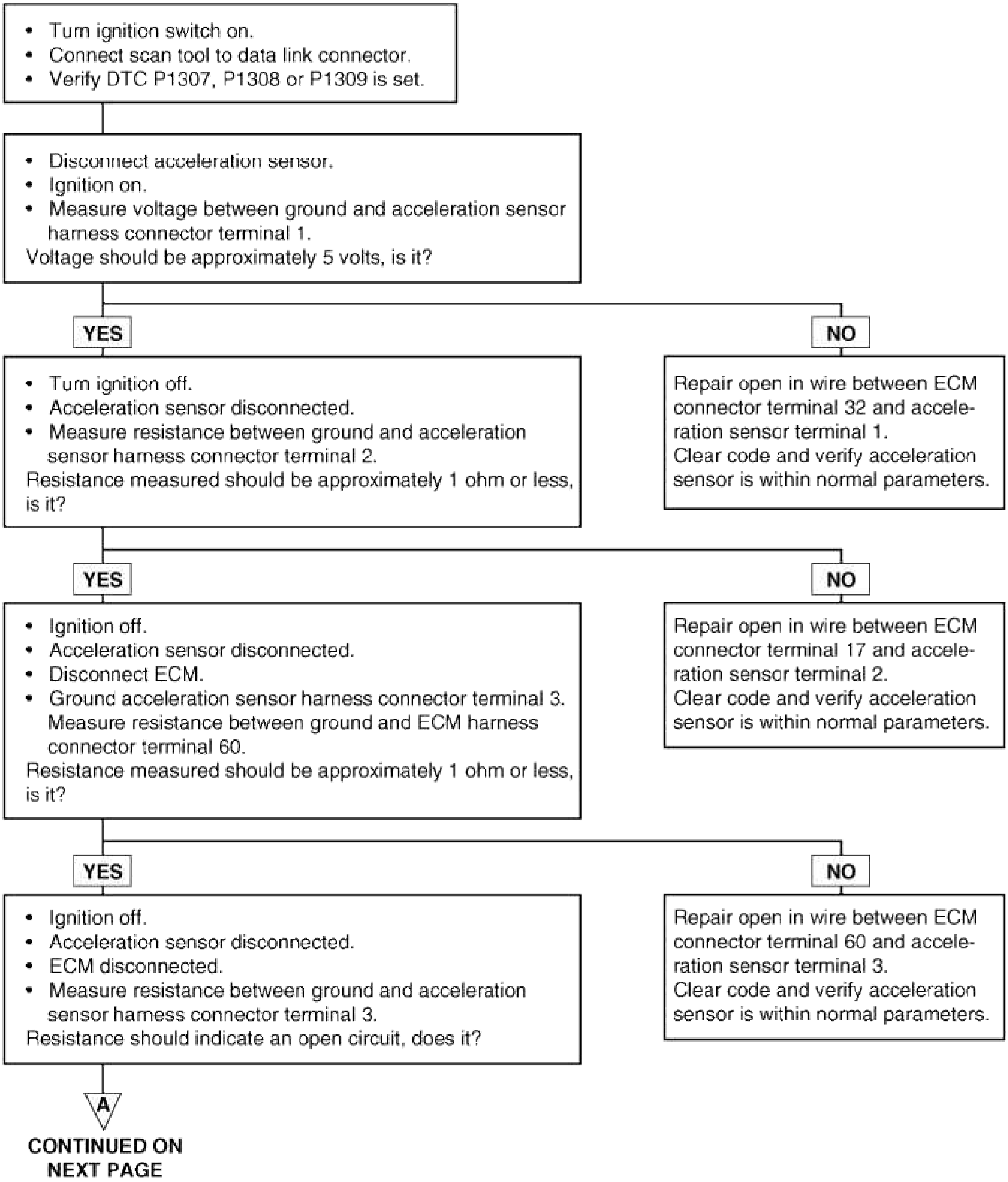
FAILURE CONDITIONS

CIRCUIT DIAGRAM


Acceleration sensor
3
2
1
60
17
32
Sensor signal
Sensor ground
Sensor power(5V)
E C M

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn ignition switch on.
- Connect scan tool to data link connector.
- Verify DTC P1307, P1308 or P1309 is set.

- Disconnect acceleration sensor.
- Ignition on.
- Measure voltage between ground and acceleration sensor harness connector terminal 1.

Voltage should be approximately 5 volts, is it?

- Turn ignition off.
- Acceleration sensor disconnected.
- Measure resistance between ground and acceleration sensor harness connector terminal 2.

Resistance measured should be approximately 1 ohm or less, is it?

Repair open in wire between ECM connector terminal 32 and acceleration sensor terminal 1.
Clear code and verify acceleration sensor is within normal parameters.

- Ignition off.
- Acceleration sensor disconnected.
- Disconnect ECM.
- Ground acceleration sensor harness connector terminal 3. Measure resistance between ground and ECM harness connector terminal 60.

Resistance measured should be approximately 1 ohm or less, is it?

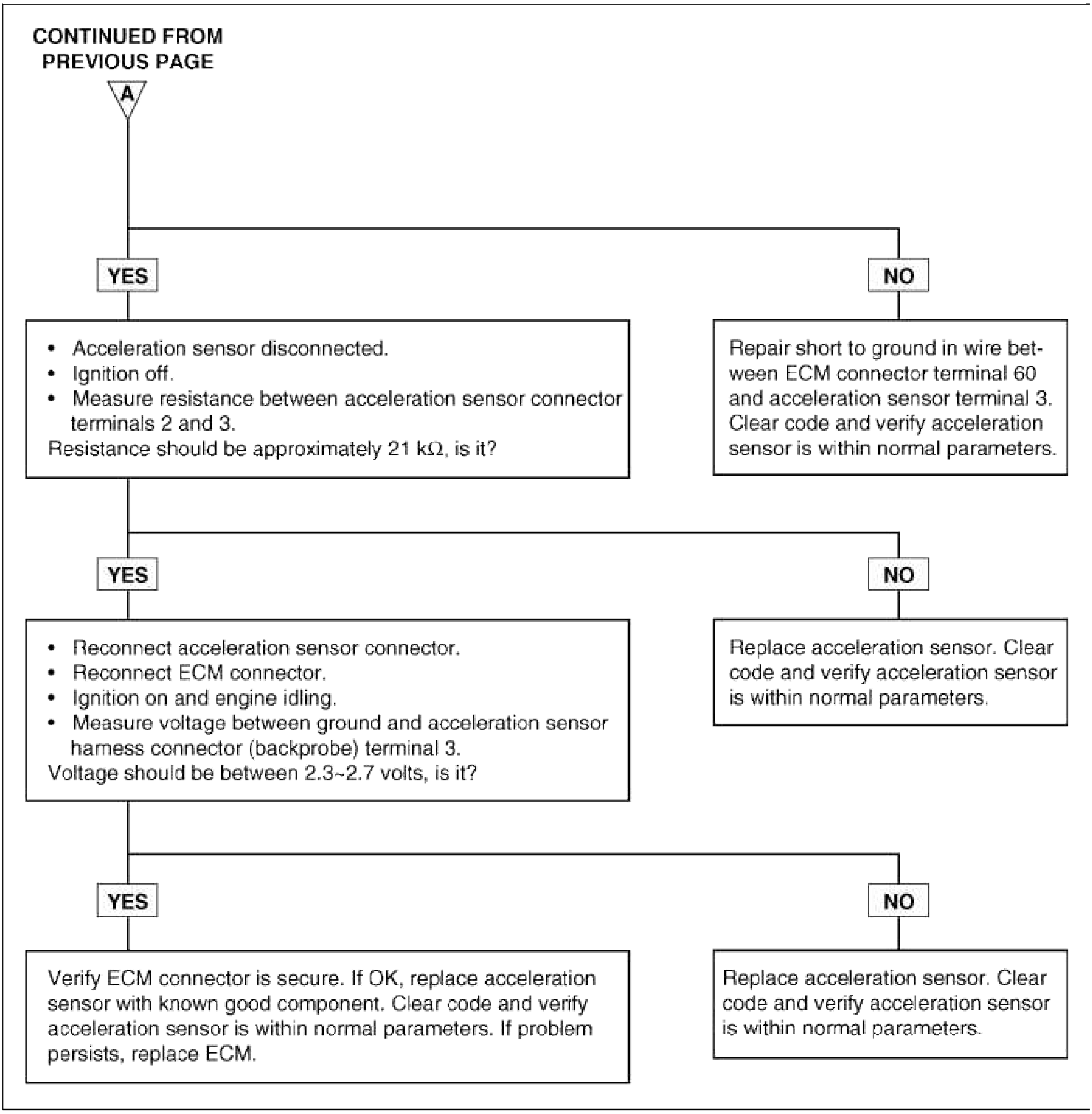
Repair open in wire between ECM connector terminal 17 and acceleration sensor terminal 2.
Clear code and verify acceleration sensor is within normal parameters.

- Ignition off.
- Acceleration sensor disconnected.
- ECM disconnected.
- Measure resistance between ground and acceleration sensor harness connector terminal 3.

Resistance should indicate an open circuit, does it?

Repair open in wire between ECM connector terminal 60 and acceleration sensor terminal 3.
Clear code and verify acceleration sensor is within normal parameters.

CONTINUED ON
NEXT PAGE



- Acceleration sensor disconnected.
- Ignition off.
- Measure resistance between acceleration sensor connector terminals 2 and 3.

Resistance should be approximately 21 kΩ, is it?

Repair short to ground in wire between ECM connector terminal 60 and acceleration sensor terminal 3. Clear code and verify acceleration sensor is within normal parameters.

- Reconnect acceleration sensor connector.
- Reconnect ECM connector.
- Ignition on and engine idling.
- Measure voltage between ground and acceleration sensor harness connector (backprobe) terminal 3.

Voltage should be between 2.3~2.7 volts, is it?

Replace acceleration sensor. Clear code and verify acceleration sensor is within normal parameters.

Verify ECM connector is secure. If OK, replace acceleration sensor with known good component. Clear code and verify acceleration sensor is within normal parameters. If problem persists, replace ECM.

Replace acceleration sensor. Clear code and verify acceleration sensor is within normal parameters.

Fuel System > Troubleshooting > P1505

[P1505/P1507]

DTC	Diagnostic item
P1505 P1507	Idle Charge Actuator Signal Low of Coil #1 Idle Charge Actuator Signal Low of Coil #2

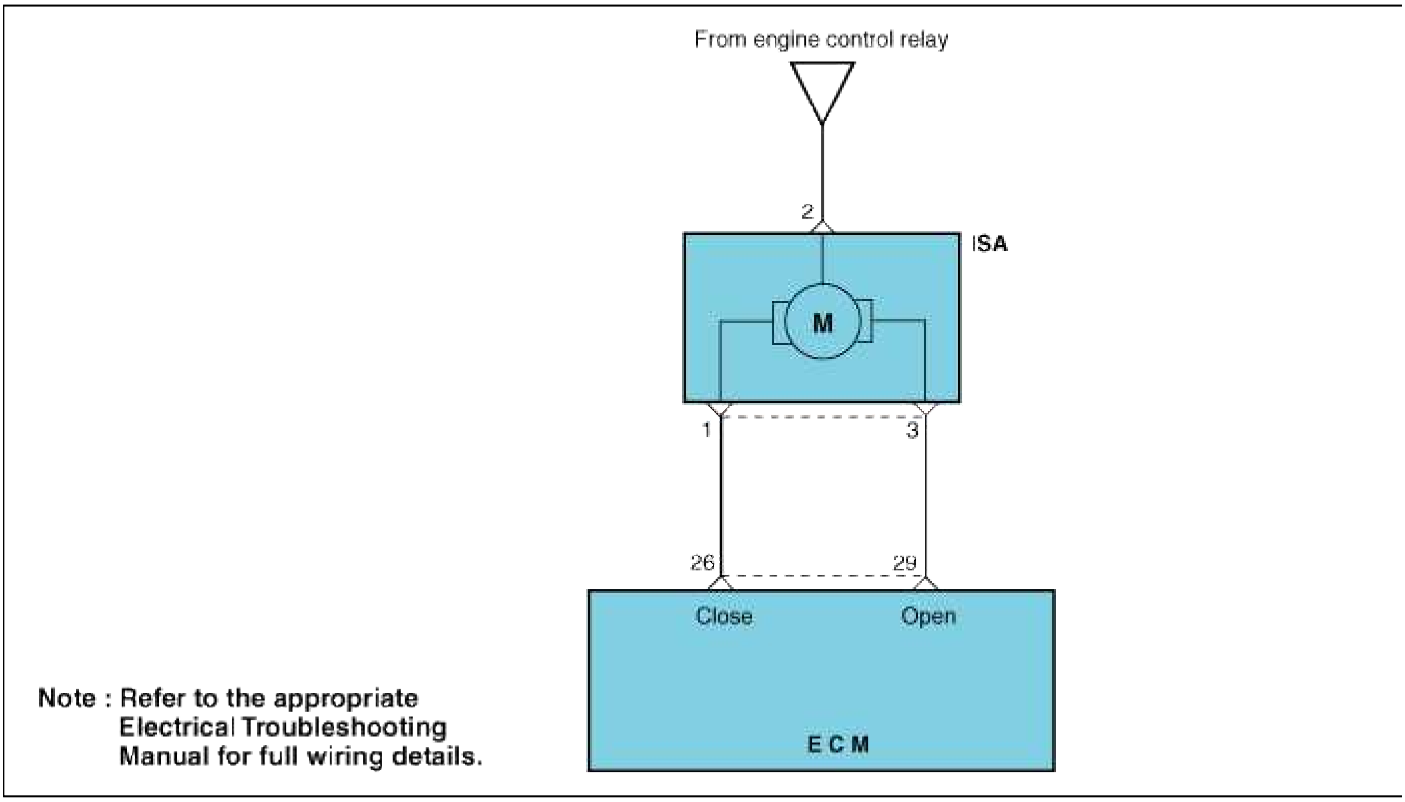
DESCRIPTION

The Idle Speed Control (ISC) actuator has two coils that are driven by separate ECM driver stages. Depending on the pulse duty factor, the equilibrium of the magnetic forces of the two coils will result in different directions for the magnetic forces of the two coils. This will result in different positions for the actuator. In parallel to the throttle valve, a bypass hose line is arranged where the ISC actuator is inserted.

FAILURE CONDITIONS

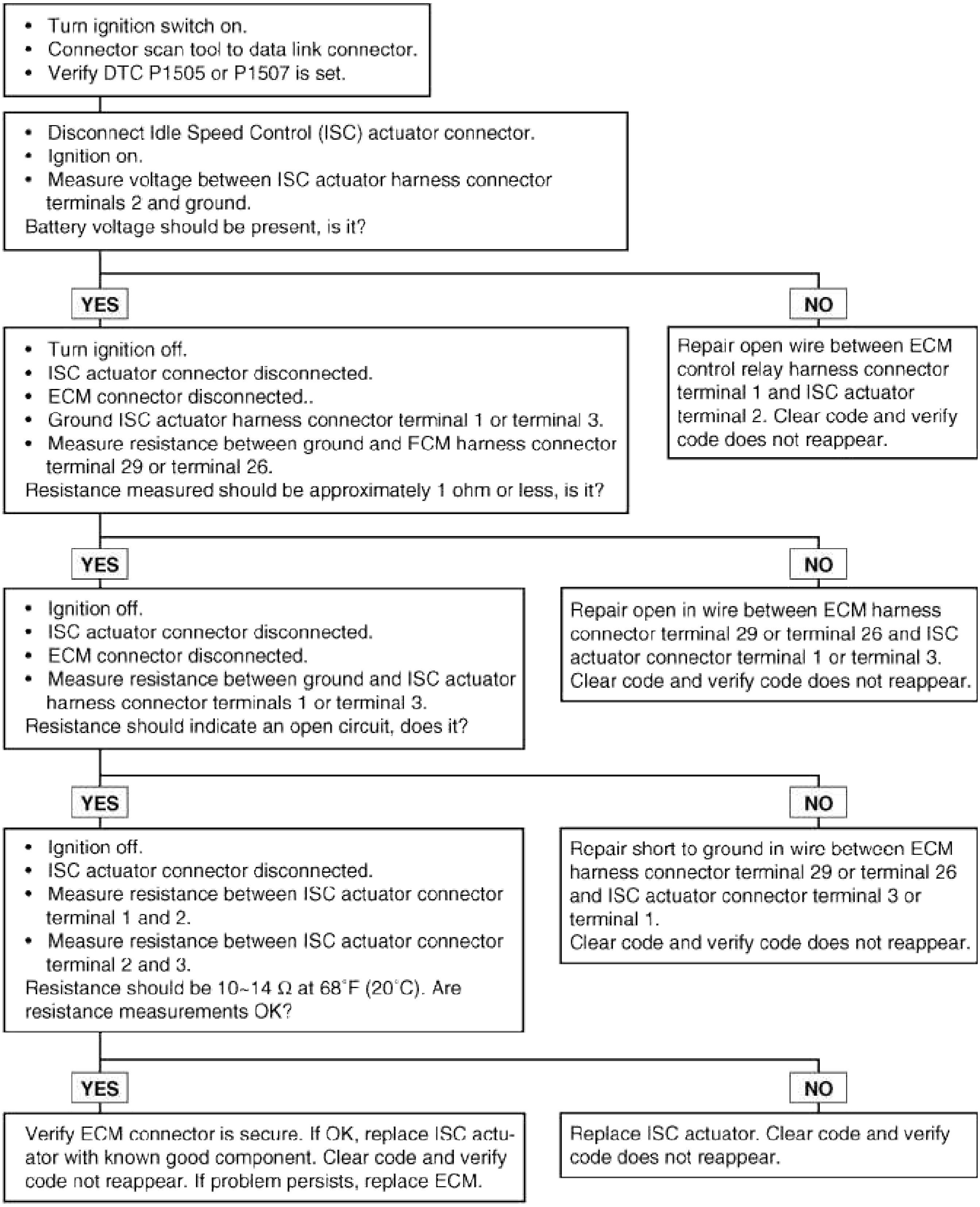
The ECM will set a code and the MIL will turn on if ISC actuator's opening coil driver stage [for P1505] or closing coil driver stage [for P1507] is open or shorted to ground during two driving cycles.

CIRCUIT DIAGRAM


From engine control relay
2
ISA
M
1
3
26
29
Close
Open
E C M

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn ignition switch on.
- Connector scan tool to data link connector.
- Verify DTC P1505 or P1507 is set.

- Disconnect Idle Speed Control (ISC) actuator connector.
- Ignition on.
- Measure voltage between ISC actuator harness connector terminals 2 and ground.

Battery voltage should be present, is it?

- Turn ignition off.
- ISC actuator connector disconnected.
- ECM connector disconnected..
- Ground ISC actuator harness connector terminal 1 or terminal 3.
- Measure resistance between ground and FCM harness connector terminal 29 or terminal 26.

Resistance measured should be approximately 1 ohm or less, is it?

Repair open wire between ECM control relay harness connector terminal 1 and ISC actuator terminal 2. Clear code and verify code does not reappear.

- Ignition off.
- ISC actuator connector disconnected.
- ECM connector disconnected.
- Measure resistance between ground and ISC actuator harness connector terminals 1 or terminal 3.

Resistance should indicate an open circuit, does it?

Repair open in wire between ECM harness connector terminal 29 or terminal 26 and ISC actuator connector terminal 1 or terminal 3. Clear code and verify code does not reappear.

- Ignition off.
- ISC actuator connector disconnected.
- Measure resistance between ISC actuator connector terminal 1 and 2.
- Measure resistance between ISC actuator connector terminal 2 and 3.

Resistance should be 10~14 Ω at 68°F (20°C). Are resistance measurements OK?

Repair short to ground in wire between ECM harness connector terminal 29 or terminal 26 and ISC actuator connector terminal 3 or terminal 1.
Clear code and verify code does not reappear.

Verify ECM connector is secure. If OK, replace ISC actuator with known good component. Clear code and verify code not reappear. If problem persists, replace ECM.

Replace ISC actuator. Clear code and verify code does not reappear.

Fuel System > Troubleshooting > P1506

[P1506/P1508]

DTC	Diagnostic item
P1506 P1508	Idle Charge Actuator Signal High of Coil #1 Idle Charge Actuator Signal High of Coil #2

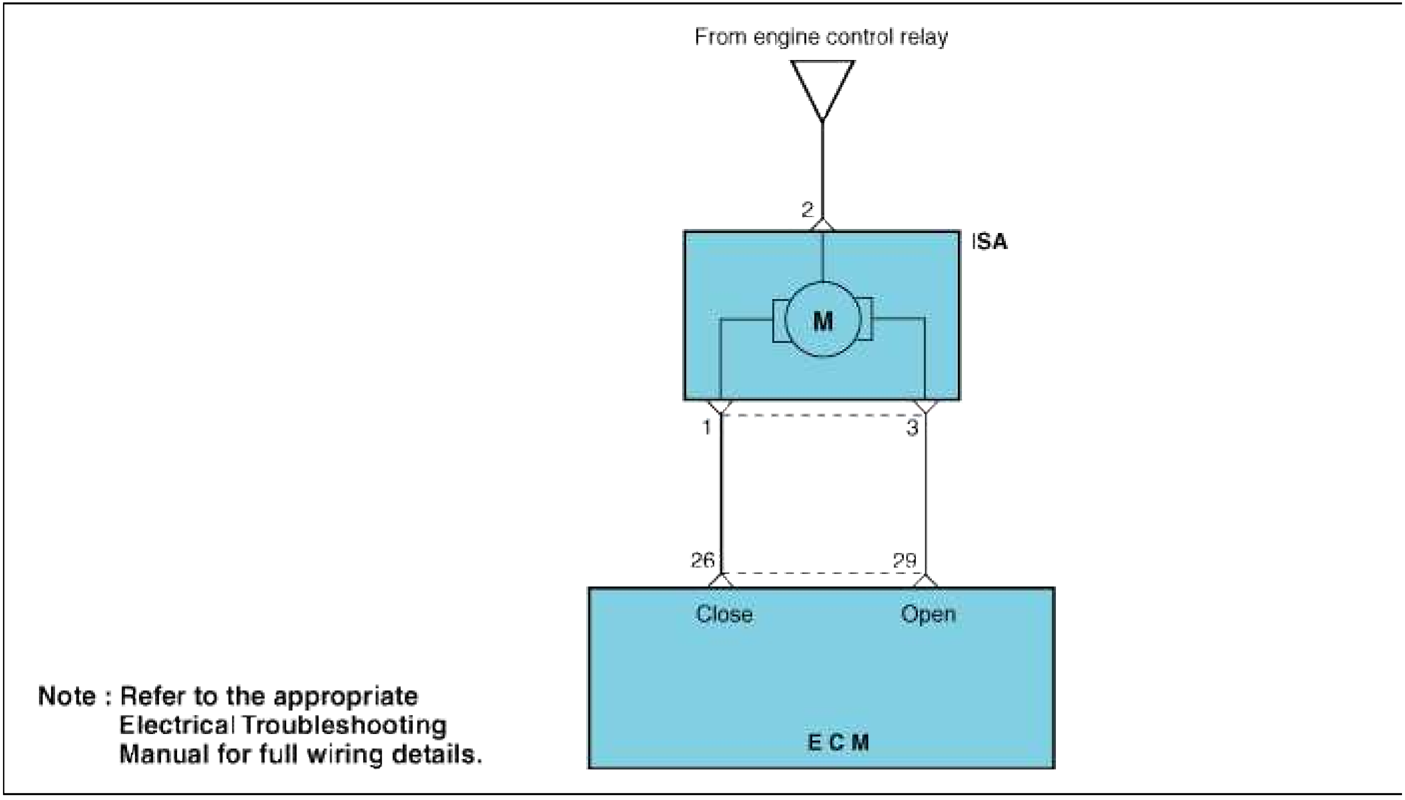
DESCRIPTION

The Idle Speed Control (ISC) actuator has two coils that are driven by separate ECM driver stages. Depending on the pulse duty factor, the equilibrium of the magnetic forces of the two coils will result in different directions for the magnetic forces of the two coils which will result in different positions for the actuator. In parallel to the throttle valve, a bypass hose line is arranged where the ISC actuator is inserted.

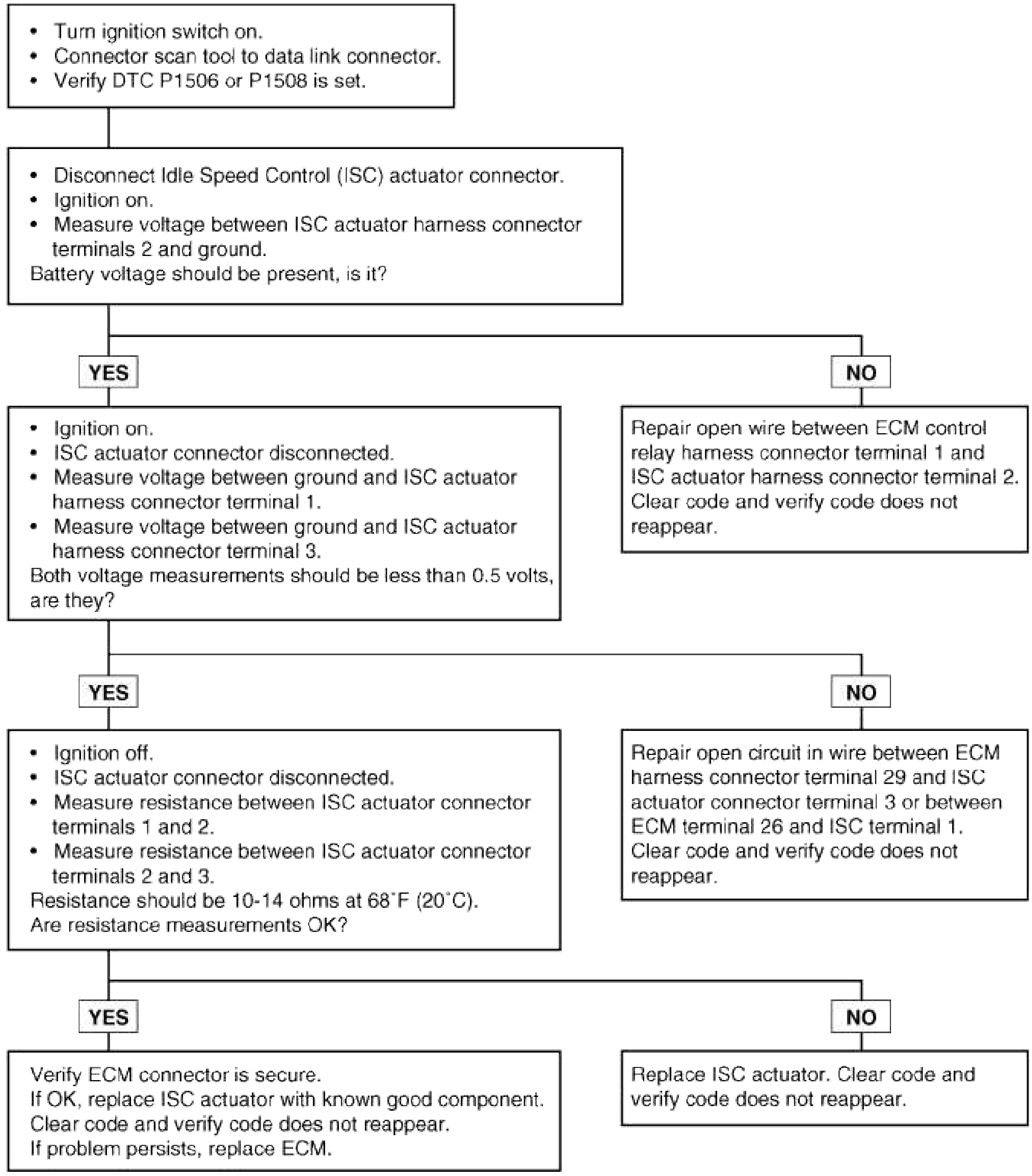
FAILURE CONDITION

The ECM will set a code and the MIL will turn on if ISC actuator's opening coil driver stage [for P1506] or closing coil driver stage [for P1508] is shorted to battery voltage during two driving cycles.

CIRCUIT DIAGRAM


From engine control relay
2
ISA
M
1
3
26
29
Close
Open
E C M
Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn ignition switch on.
- Connector scan tool to data link connector.
- Verify DTC P1506 or P1508 is set.

- Disconnect Idle Speed Control (ISC) actuator connector.
- Ignition on.
- Measure voltage between ISC actuator harness connector terminals 2 and ground.

Battery voltage should be present, is it?

- Ignition on.
- ISC actuator connector disconnected.
- Measure voltage between ground and ISC actuator harness connector terminal 1.
- Measure voltage between ground and ISC actuator harness connector terminal 3.

Both voltage measurements should be less than 0.5 volts, are they?

Repair open wire between ECM control relay harness connector terminal 1 and ISC actuator harness connector terminal 2. Clear code and verify code does not reappear.

- Ignition off.
- ISC actuator connector disconnected.
- Measure resistance between ISC actuator connector terminals 1 and 2.
- Measure resistance between ISC actuator connector terminals 2 and 3.

Resistance should be 10-14 ohms at 68˚F (20˚C).
Are resistance measurements OK?

Repair open circuit in wire between ECM harness connector terminal 29 and ISC actuator connector terminal 3 or between ECM terminal 26 and ISC terminal 1. Clear code and verify code does not reappear.

Verify ECM connector is secure.
If OK, replace ISC actuator with known good component.
Clear code and verify code does not reappear.
If problem persists, replace ECM.

Replace ISC actuator. Clear code and verify code does not reappear.

Fuel System > Troubleshooting > P1507

[P1505/P1507]

DTC	Diagnostic item
P1505 P1507	Idle Charge Actuator Signal Low of Coil #1 Idle Charge Actuator Signal Low of Coil #2

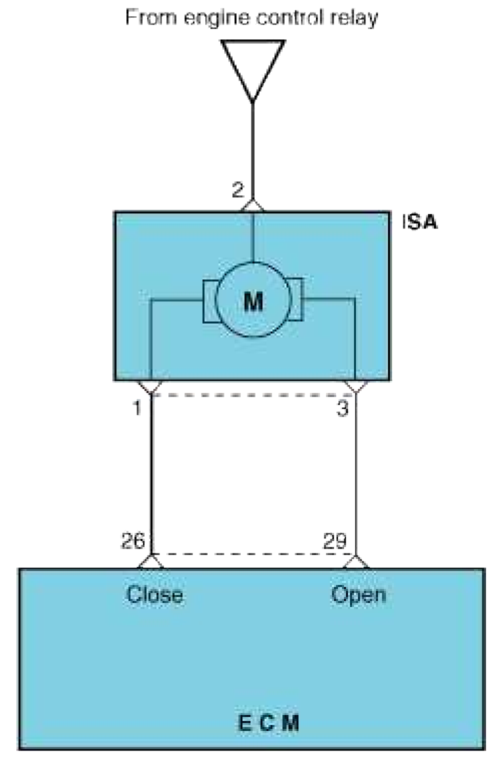
DESCRIPTION

The Idle Speed Control (ISC) actuator has two coils that are driven by separate ECM driver stages. Depending on the pulse duty factor, the equilibrium of the magnetic forces of the two coils will result in different directions for the magnetic forces of the two coils which will result in different positions for the actuator. In parallel to the throttle valve, a bypass hose line is arranged where the ISC actuator is inserted.

FAILURE CONDITIONS

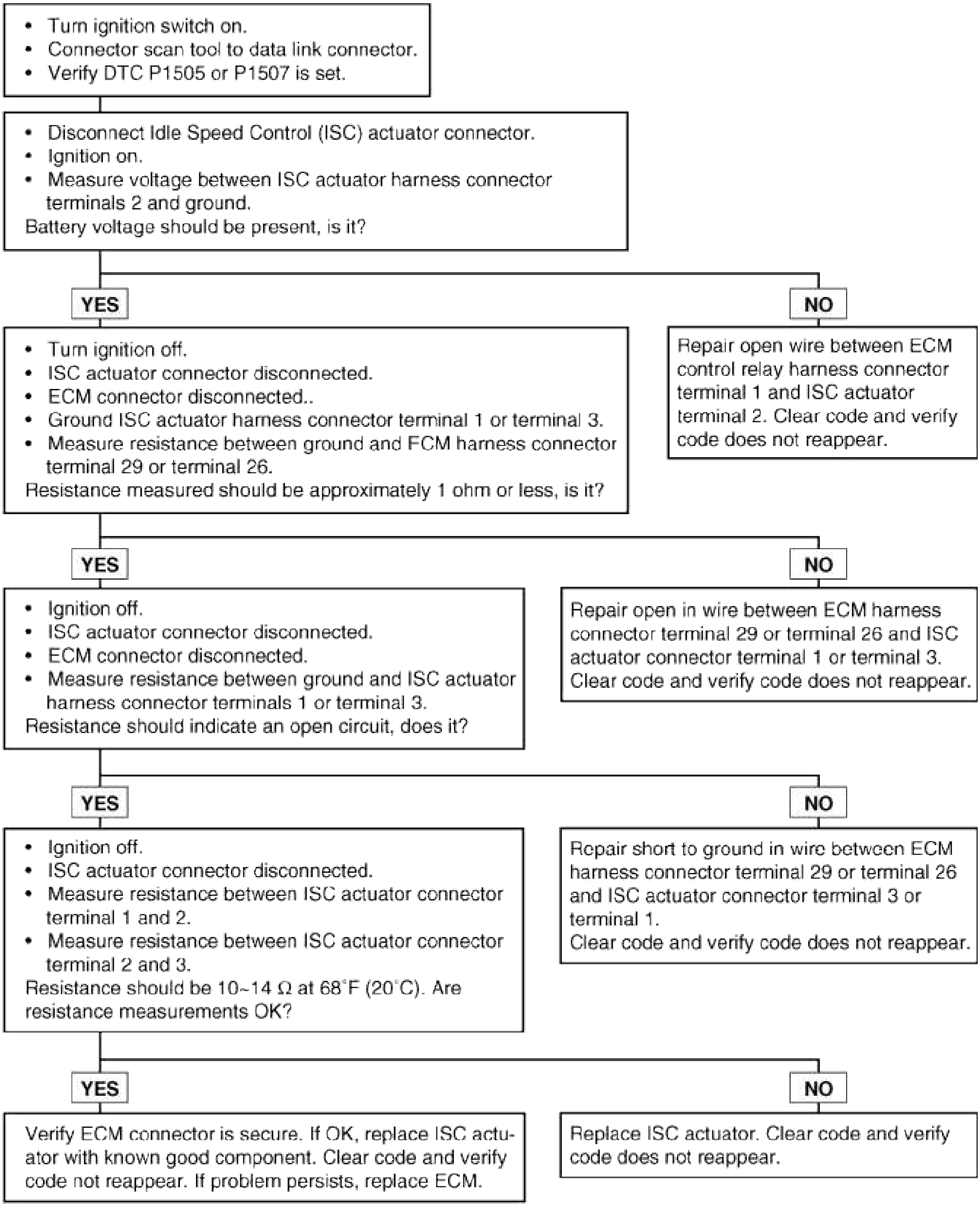
The ECM will set a code and the MIL will turn on if ISC actuator's opening coil driver stage [for P1505] or closing coil driver stage [for P1507] is open or shorted to ground during two driving cycles.

CIRCUIT DIAGRAM



Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn ignition switch on.
- Connector scan tool to data link connector.
- Verify DTC P1505 or P1507 is set.

- Disconnect Idle Speed Control (ISC) actuator connector.
- Ignition on.
- Measure voltage between ISC actuator harness connector terminals 2 and ground.

Battery voltage should be present, is it?

YES

- Turn ignition off.
- ISC actuator connector disconnected.
- ECM connector disconnected..
- Ground ISC actuator harness connector terminal 1 or terminal 3.
- Measure resistance between ground and FCM harness connector terminal 29 or terminal 26.

Resistance measured should be approximately 1 ohm or less, is it?

NO

Repair open wire between ECM control relay harness connector terminal 1 and ISC actuator terminal 2. Clear code and verify code does not reappear.

YES

- Ignition off.
- ISC actuator connector disconnected.
- ECM connector disconnected.
- Measure resistance between ground and ISC actuator harness connector terminals 1 or terminal 3.

Resistance should indicate an open circuit, does it?

NO

Repair open in wire between ECM harness connector terminal 29 or terminal 26 and ISC actuator connector terminal 1 or terminal 3. Clear code and verify code does not reappear.

YES

- Ignition off.
- ISC actuator connector disconnected.
- Measure resistance between ISC actuator connector terminal 1 and 2.
- Measure resistance between ISC actuator connector terminal 2 and 3.

Resistance should be 10~14 Ω at 68°F (20°C). Are resistance measurements OK?

NO

Repair short to ground in wire between ECM harness connector terminal 29 or terminal 26 and ISC actuator connector terminal 3 or terminal 1.
Clear code and verify code does not reappear.

YES

Verify ECM connector is secure. If OK, replace ISC actuator with known good component. Clear code and verify code not reappear. If problem persists, replace ECM.

NO

Replace ISC actuator. Clear code and verify code does not reappear.

Fuel System > Troubleshooting > P1508

[P1506/P1508]

DTC	Diagnostic item
P1506 P1508	Idle Charge Actuator Signal High of Coil #1 Idle Charge Actuator Signal High of Coil #2

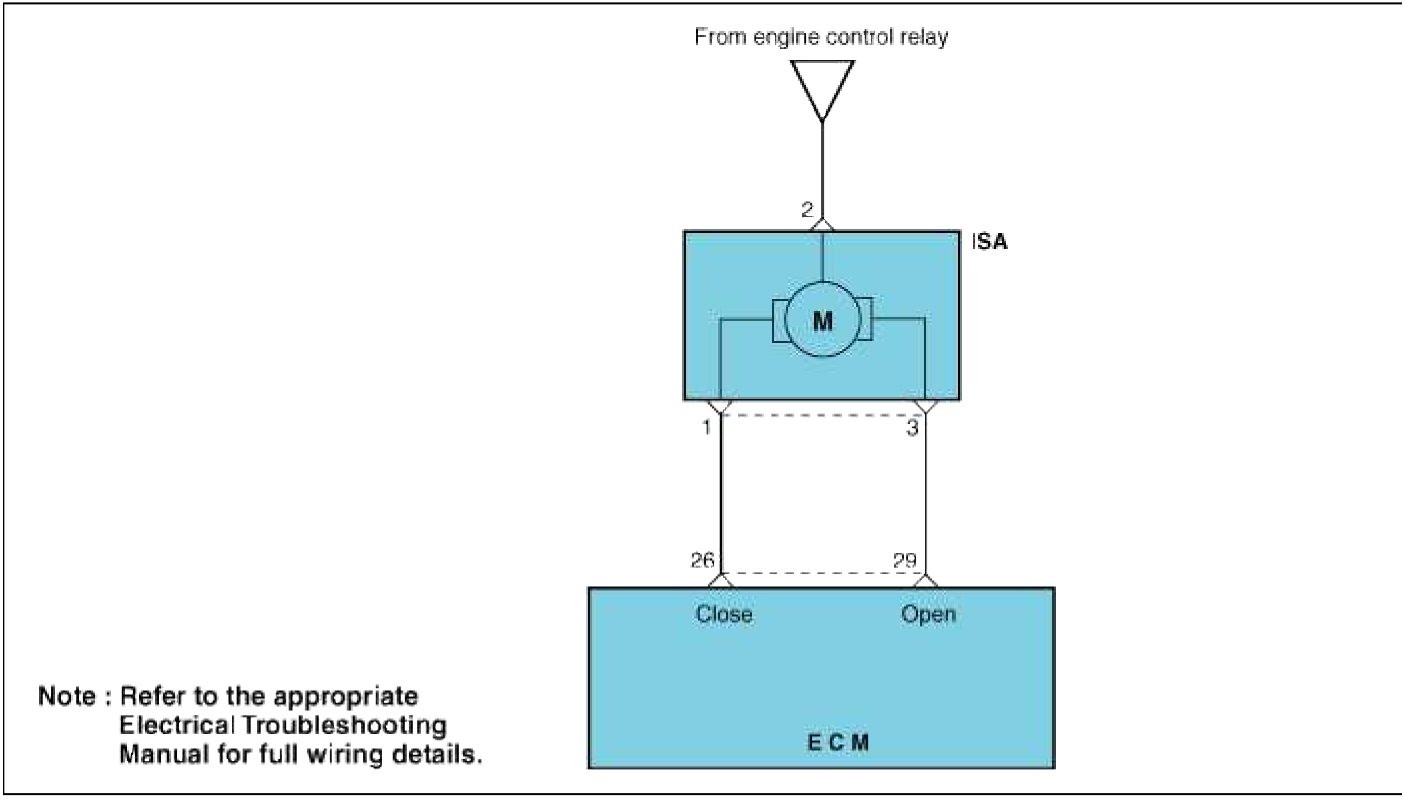
DESCRIPTION

The Idle Speed Control (ISC) actuator has two coils that are driven by separate ECM driver stages. Depending on the pulse duty factor, the equilibrium of the magnetic forces of the two coils will result in different directions for the magnetic forces of the two coils which will result in different positions for the actuator. In parallel to the throttle valve, a bypass hose line is arranged where the ISC actuator is inserted.

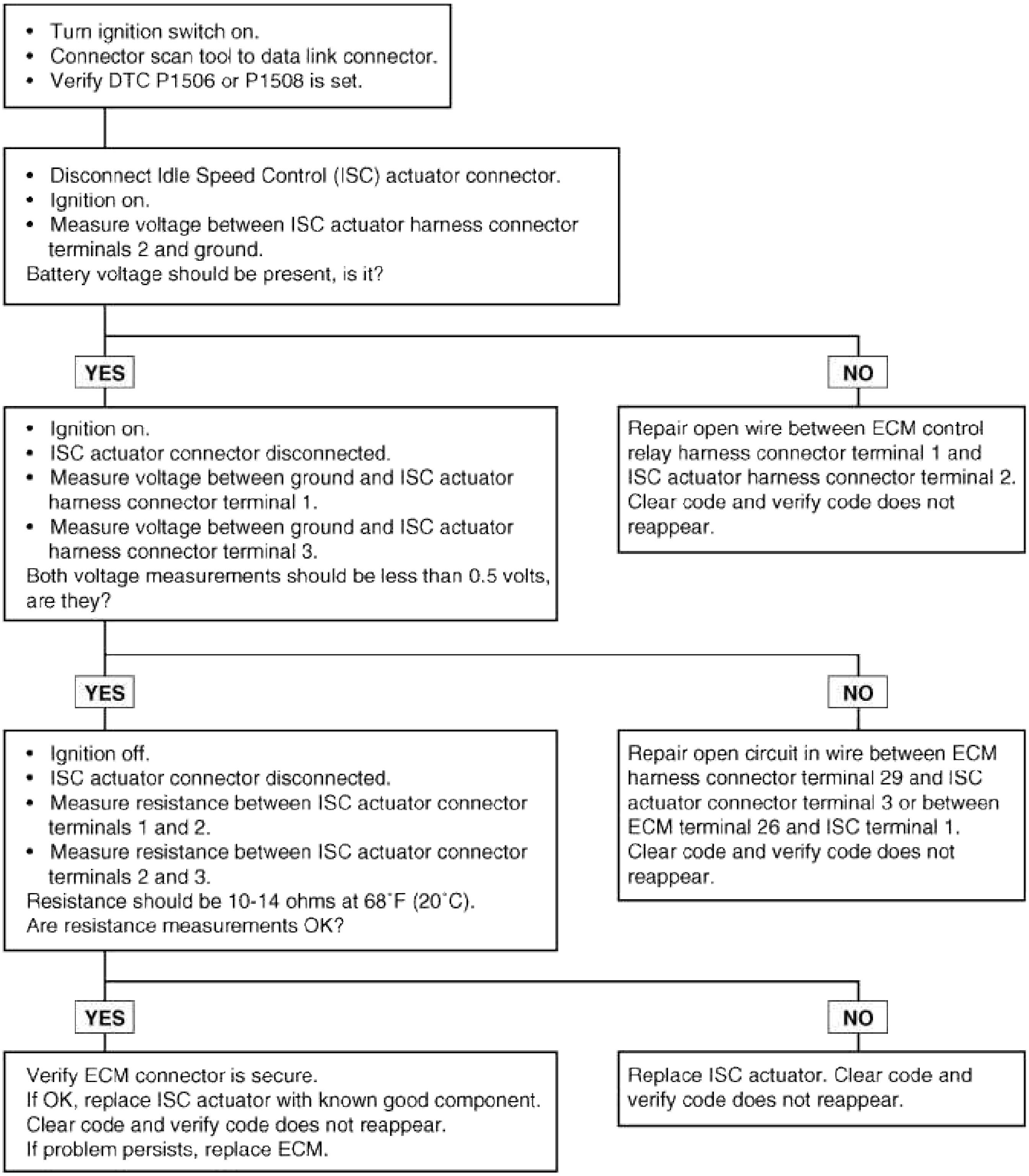
FAILURE CONDITION

The ECM will set a code and the MIL will turn on if ISC actuator's opening coil driver stage [for P1506] or closing coil driver stage [for P1508] is shorted to battery voltage during two driving cycles.

CIRCUIT DIAGRAM


From engine control relay
2
ISA
M
1
3
26
29
Close
Open
E C M
Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TEST PROCEDURE



- Turn ignition switch on.
- Connector scan tool to data link connector.
- Verify DTC P1506 or P1508 is set.

- Disconnect Idle Speed Control (ISC) actuator connector.
- Ignition on.
- Measure voltage between ISC actuator harness connector terminals 2 and ground.

Battery voltage should be present, is it?

YES:

- Ignition on.
- ISC actuator connector disconnected.
- Measure voltage between ground and ISC actuator harness connector terminal 1.
- Measure voltage between ground and ISC actuator harness connector terminal 3.

Both voltage measurements should be less than 0.5 volts, are they?

NO:

Repair open wire between ECM control relay harness connector terminal 1 and ISC actuator harness connector terminal 2. Clear code and verify code does not reappear.

YES:

- Ignition off.
- ISC actuator connector disconnected.
- Measure resistance between ISC actuator connector terminals 1 and 2.
- Measure resistance between ISC actuator connector terminals 2 and 3.

Resistance should be 10-14 ohms at 68˚F (20˚C).
Are resistance measurements OK?

NO:

Repair open circuit in wire between ECM harness connector terminal 29 and ISC actuator connector terminal 3 or between ECM terminal 26 and ISC terminal 1. Clear code and verify code does not reappear.

YES:

Verify ECM connector is secure.
If OK, replace ISC actuator with known good component.
Clear code and verify code does not reappear.
If problem persists, replace ECM.

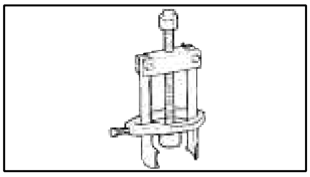
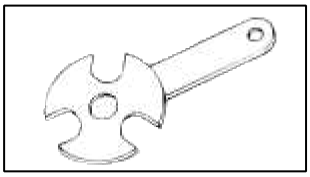
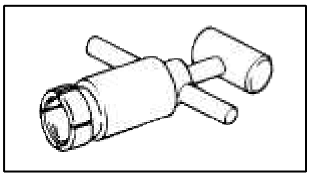
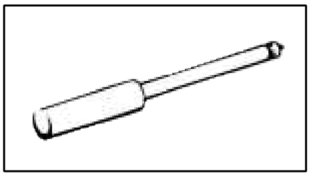
NO:

Replace ISC actuator. Clear code and verify code does not reappear.

ACCENT(LC) > 2002 > G 1.5 SOHC > Heating,Ventilation, Air Condioning

Heating,Ventilation, Air Condioning > General Information > Special Service Tools

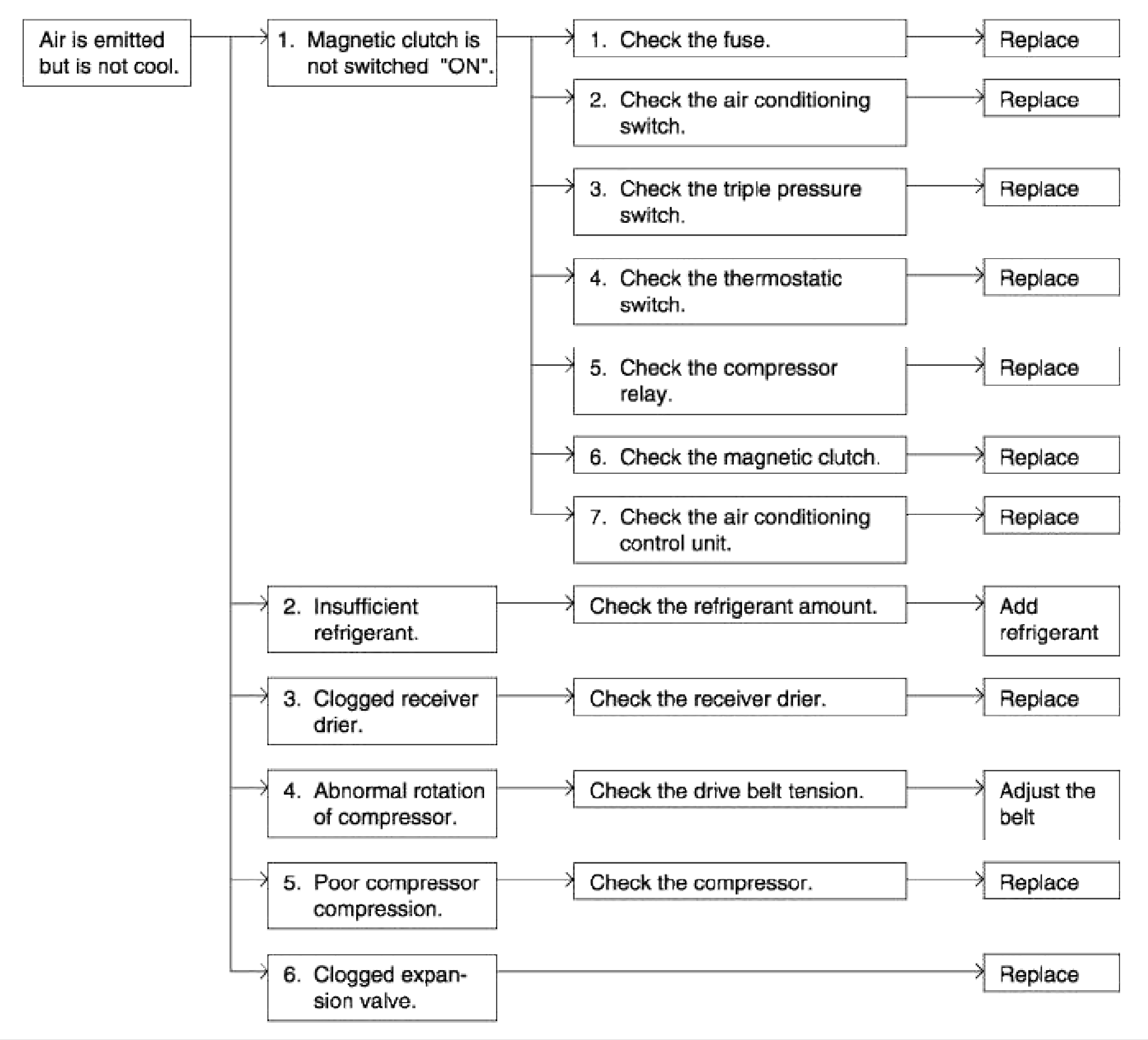
SPECIAL TOOLS

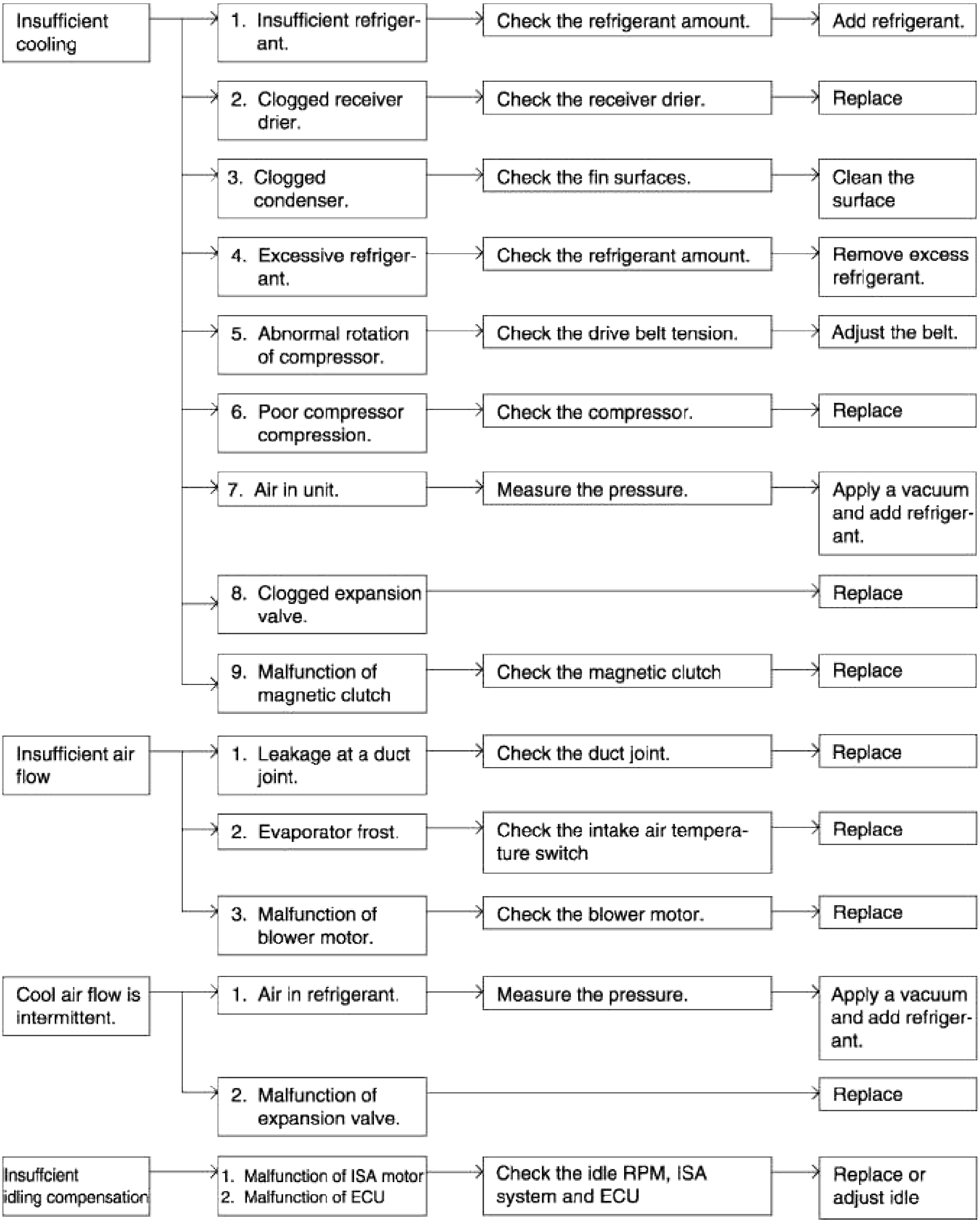
Tool (Number and name)	Illustration	Use
09455-34000 Bearing and gear puller		Removal of field coil
09977-34000 Pressure plate bolt remover		Removal of pressure plate
09977-33700 Shaft seal remover and installer		Removal and installation of shaft seal
09977-33800 Snap ring remover		Removal of snap ring

Heating,Ventilation, Air Condioning > General Information > Troubleshooting

TROUBLESHOOTING

The following diagnostic charts have been developed as a quick reference for determining the cause of the malfunction.


Air is emitted but is not cool.
1. Magnetic clutch is not switched "ON".
1. Check the fuse.
Replace
2. Check the air conditioning switch.
Replace
3. Check the triple pressure switch.
Replace
4. Check the thermostatic switch.
Replace
5. Check the compressor relay.
Replace
6. Check the magnetic clutch.
Replace
7. Check the air conditioning control unit.
Replace
2. Insufficient refrigerant.
Check the refrigerant amount.
Add refrigerant
3. Clogged receiver drier.
Check the receiver drier.
Replace
4. Abnormal rotation of compressor.
Check the drive belt tension.
Adjust the belt
5. Poor compressor compression.
Check the compressor.
Replace
6. Clogged expansion valve.
Replace



Insufficient cooling	1. Insufficient refrigerant.	Check the refrigerant amount.	Add refrigerant.
	2. Clogged receiver drier.	Check the receiver drier.	Replace
	3. Clogged condenser.	Check the fin surfaces.	Clean the surface
	4. Excessive refrigerant.	Check the refrigerant amount.	Remove excess refrigerant.
	5. Abnormal rotation of compressor.	Check the drive belt tension.	Adjust the belt.
	6. Poor compressor compression.	Check the compressor.	Replace
	7. Air in unit.	Measure the pressure.	Apply a vacuum and add refrigerant.
	8. Clogged expansion valve.		Replace
	9. Malfunction of magnetic clutch	Check the magnetic clutch	Replace
Insufficient air flow	1. Leakage at a duct joint.	Check the duct joint.	Replace
	2. Evaporator frost.	Check the intake air temperature switch	Replace
	3. Malfunction of blower motor.	Check the blower motor.	Replace
Cool air flow is intermittent.	1. Air in refrigerant.	Measure the pressure.	Apply a vacuum and add refrigerant.
	2. Malfunction of expansion valve.		Replace
Insuffcient idling compensation	1. Malfunction of ISA motor 2. Malfunction of ECU	Check the idle RPM, ISA system and ECU	Replace or adjust idle

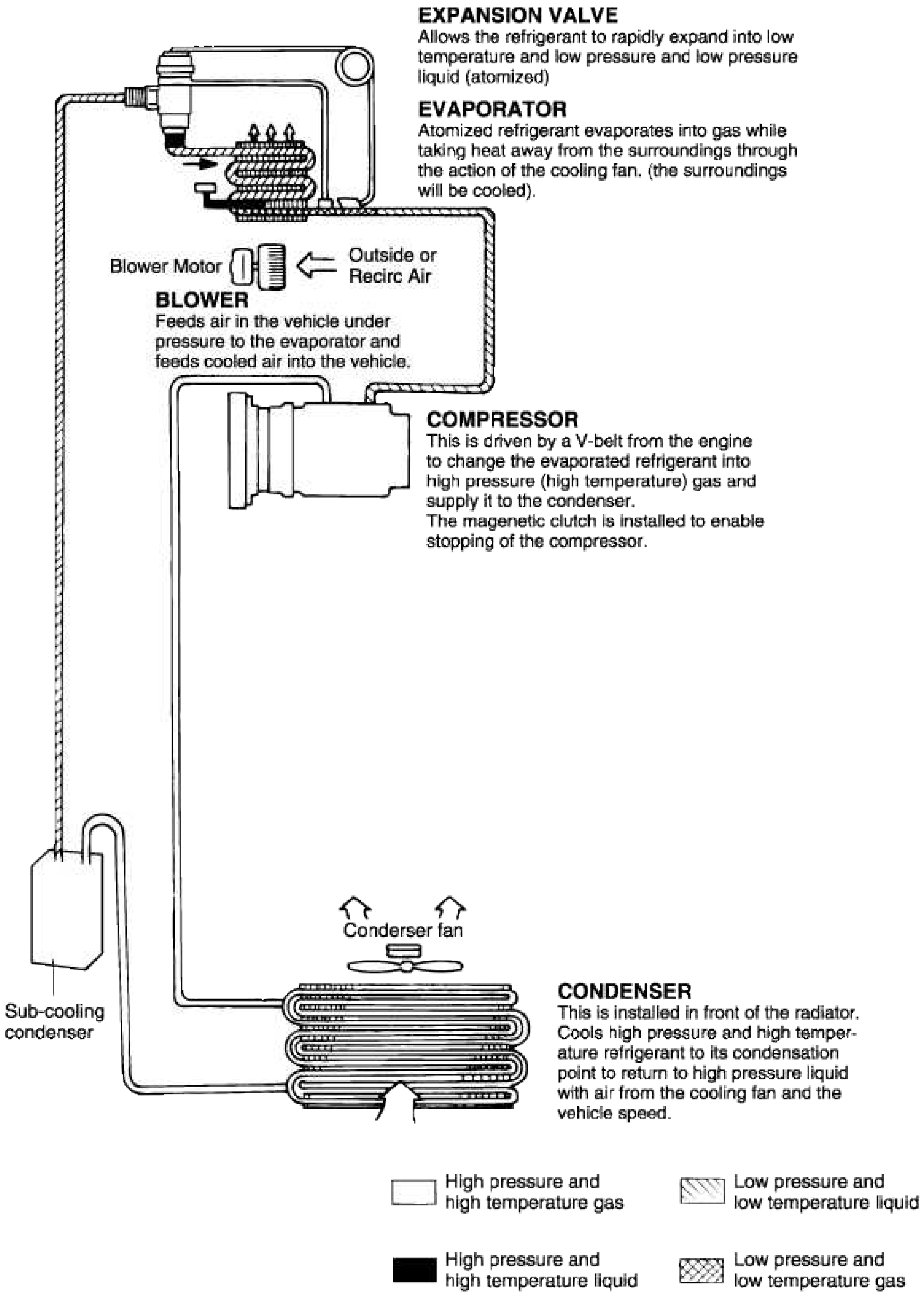
Heating,Ventilation, Air Condioning > General Information > Specifications

SPECIFICATIONS

Item		Specification
Heater	Type	Air mix type
	Capacity (Kcal/h)	4,500 ± 10%
Air conditioning	**Evaporator** - Cooling capacity (Kcal/h) - Working pressure	4,100 ± 10% 35~42.2kgf/cm^2 Min. 28.1kgf/cm^2
	Compressor - Type - Oil capacity - Piston displacement	Swash plate (HS-15) FD 46XG (PAG) 180±10cc 154cc/rev
	Condenser - Heat capacity	A/T : 11,800 ± 5% Kcal/h M/T 1.6 DOHC : 11,800 ± 5% Kcal M/T 1.5 SOHC : 9,400 ± 5% Kcal/h
	Magnetic clutch - Voltage&wattage - Torque	D.C 12.8, Max 54W 4.4 kg·m
	Refrigerant&capacity	R-134a (550±25g)
	Triple pressure switch	**High pressure** - OFF 32kgf/cm^2 - ON 26kgf/cm^2
		Middle pressure - OFF 14kgf/cm^2 - ON 18kgf/cm^2
		Low pressure - OFF 2.0kgf/cm^2 - ON 2.25kgf/cm^2
	Thermostat	OFF 1.5 ± 0.6°C ON 3.0 ± 0.6°C
Heater control assembly		Rotary Cable Type

Heating,Ventilation, Air Condioning > Air conditioning System > Flow Diagram

REFRIGERATION CYCLE



EXPANSION VALVE
Allows the refrigerant to rapidly expand into low temperature and low pressure and low pressure liquid (atomized)

EVAPORATOR
Atomized refrigerant evaporates into gas while taking heat away from the surroundings through the action of the cooling fan. (the surroundings will be cooled).

BLOWER
Feeds air in the vehicle under pressure to the evaporator and feeds cooled air into the vehicle.

COMPRESSOR
This is driven by a V-belt from the engine to change the evaporated refrigerant into high pressure (high temperature) gas and supply it to the condenser.
The magenetic clutch is installed to enable stopping of the compressor.

CONDENSER
This is installed in front of the radiator. Cools high pressure and high temperature refrigerant to its condensation point to return to high pressure liquid with air from the cooling fan and the vehicle speed.

☐ High pressure and high temperature gas
▨ Low pressure and low temperature liquid
■ High pressure and high temperature liquid
▩ Low pressure and low temperature gas

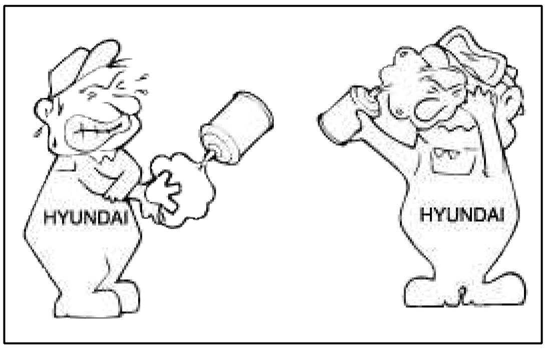
Heating,Ventilation, Air Condioning > Air conditioning System > General Information

GENERAL

WHEN HANDLING REFRIGERANT

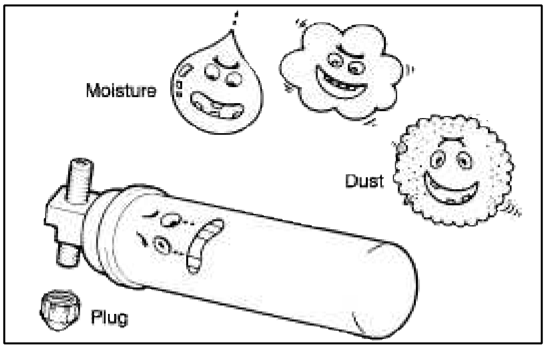
1. R-134a liquid refrigerant is highly volatile. A drop on the skin of your hand could result in localized frostbite. When handling the refrigerant, be sure to wear gloves.
2. It is standard practice to wear goggles or glasses to protect your eyes, and gloves to protect your hands. If the refrigerant splashes into your eyes, wash them with clean water immediately.

3. The R-134a container is highly pressurized. Never leave it in a hot place, and check that the storage temperature is below 52°C (126°F).
4. A electronic leak detector should be used to check the system for refrigerant leakage. Bear in mind that the R-134a, upon coming into contact with flame, produces phosgene, a highly toxic gas.
5. Use only recommended the lubricant for R-134a systems. If lubricants other than the recommended one used, system failure may occur.
6. PAG lubricant absorbs moisture from the atmosphere at a rapid rate, therefore the following precautions must be observed :
   - A. When removing refrigerant components from a vehicle, cap immediately the components to prevent from the entry of moisture.
   - B. When installing refrigerant components to a vehicle, do not remove the cap until just before connecting the components.
   - C. Complete the connection of all refrigerant tubes and hoses without delay to prevent the A/C system from taking on moisture.
   - D. Use the recommended lubricant from a sealed container only.
7. If an accidental discharge in the system occurs, ventilate the work area before resuming service.



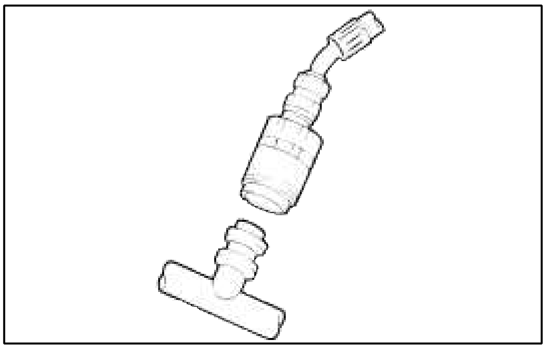
WHEN REPLACING PARTS ON A/C SYSTEM

1. Never open or loosen a connection before discharging the system.
2. Seal the open fittings of components with a cap or plug immediately to prevent intrusion of moisture or dust.
3. Do not remove the sealing caps from a replacement component until it is ready to be installed.
4. Before connecting an open fitting, always install a new sealing ring. Coat the fitting and seal with refrigerant oil before making the connection.

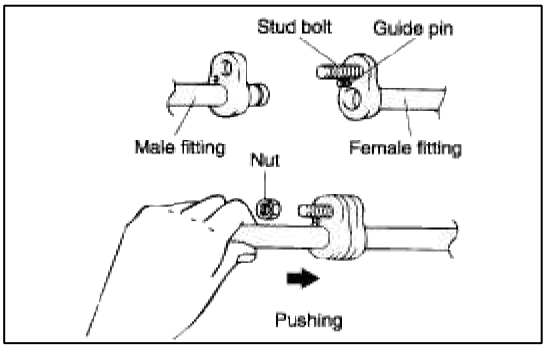


WHEN INSTALLING CONNECTING PARTS

1. BOLT/NUT COUPLING TYPE
    (1) Lubricate each connecting parts with compressor oil so as to tighten them easily, enough to prevent refrigerant leaks.
    (2) Use two wrenches not to twist the tube.
    (3) Tighten them to the specified torque.



2. FLANGE WITH GUIDE PIN TYPE
    (1) Check the O-ring for missing and damage, then lubricate it with compressor oil.
    (2) Push the pipe as shown in the illustration and tighten the nut by hand.
    (3) Tighten the nut to the specified torque.



COMPRESSOR OIL

The oil used to lubricate the compressor circulates in the system while the compressor is operating. Whenever replacing any component of the system or when a large amount of gas leakage occurs, add oil to maintain the original total amount of oil.

Single : 170~190cc

1. HANDLING OF OIL
    (1) The oil should be free from moisture, dust, metal filings, etc.
    (2) Do not mix oils.
    (3) The moisture content in the oil increases when exposed to air for prolonged periods. After use, seal the container immediately.
2. OIL RETURN OPERATION

    To check the oil level or add oil, idle engine for 20~30 minutes and setting the heater control set to maximum cooling and blower level, to return the lubricant to compressor.

3. CHECKING AND ADDING COMPRESSOR OIL

In order to add oil to an operating compressor, check the compressor oil using the following procedure:

(1) Perform the oil return operation, stop the engine, discharge the refrigerant, and dismantle the compressor from vehicle.

(2) Discharge oil from the system line outlet.

> NOTE
>
> If compressor is cold, sometimes it can be hard to drain the oil. Warm up the compressor (approx. 40~50°C) to drain the oil.

(3) Check the amount of the discharged oil. If it is less than 70cc, it means there is a little leak of oil. Perform the leakage test on each system connection, and repair or replace faulty parts if necessary.

(4) Check oil for contamination and set the oil level in the following procedure:

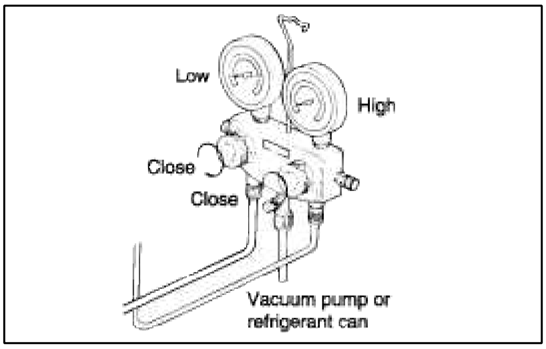
WHEN OIL IS CLEAN

Discharge	Setting
Above 70cc	Oil level is normal, add equal amount of discharged oil.
Below 70cc	Oil level is low, add 70cc of oil.

INSTALLATION OF MANIFOLD GAUGE SET

> CAUTION
>
> When connecting the manifold gauge set, be sure to observe all safety precautions.

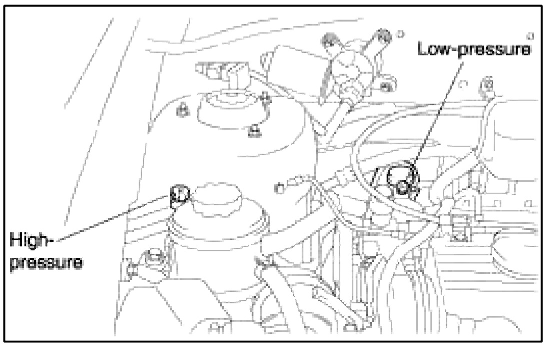
1. Close both hand valves of the manifold gauge fittings.
2. Install the charging hoses of the gauge set to the fittings. Connect the low-pressure hose to the low-pressure service port, and the high-pressure hose to the high-pressure service port. Tighten the hose nuts by hand.



> NOTE
>
> When charging the refrigerant, do it after removing the engine cover and the air intake hose.

REFRIGERANT DISCHARGING PROCEDURE

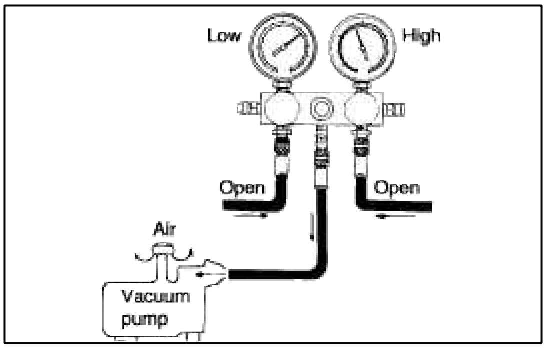
1. Connect the manifold gauge set to the system.



2. Put a towel under the open end of the center hose.
3. Open the high pressure valve slowly to discharge the refrigerant.

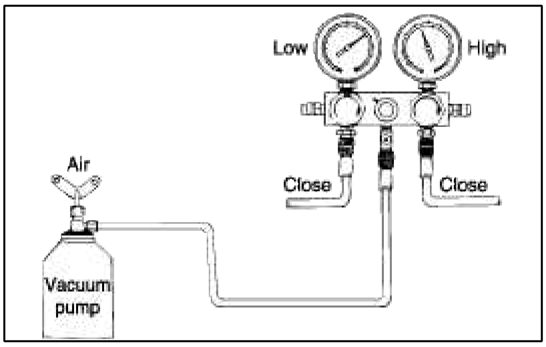
> **NOTE**
>
> If discharging the refrigerant too fast, compressor oil may drain from the system.

4. Check if the towel is stained with oil. If so, gently close the valve.
5. If the manifold gauge reading drops below 3.5kg·cm², open the low pressure valve slowly.
6. Open the high and low pressure valves slowly in order to drop the system pressure until the gauge indicates 0kg·cm².



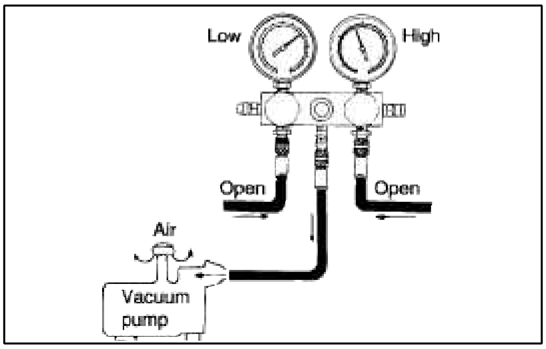
EVACUATING REFRIGERANT

> **NOTE**
>
> It is necessary to evacuate the air conditioning system any time the system has been opened. Evacuation is necessary to rid the system of all air and moisture that may have been allowed to enter the unit. After installation of a component, the system should be evacuated for approximately 15 minutes. A component in service that has been opened for repair should be evacuated for 30 minutes.



1. Engine should be off.
2. Connect a manifold gauge set to the compressor gauge fittings. Close both high and low pressure valves.
3. Make sure the refrigerant has been discharged from the system.
4. Connect the center hose of the gauge set to the vacuum pump inlet.
5. Start the vacuum pump and then open the high and low manifold pressure valves.
6. After about ten minutes, check that the low pressure gauge reads more than 94,39 kPa (0.96 kg·cm², 13.7 psi) of vacuum. If negative pressure can not be obtained, there is a leak in the system. In this case, repair the leak as follows:
   (1) Close both manifold valves and stop the vacuum pump.
   (2) Charge the system with a can of refrigerant [about 0.4 kg (0.9 lb)]. Refer to Charging Refrigerant.
   (3) Check for refrigerant leakage with a leak detector. Repair any leakage found. Refer to Checking Refrigerant Leak.
   (4) Discharge refrigerant again, and then evacuate the system. If no leaks are found, continue evacuating the system.

7. Start the vacuum pump.
8. Open both manifold pressure valves to obtain 94.39 kPa (0.96 kg·cm², 13.7 psi) of vacuum.
9. After the low pressure manifold gauge indicates close to 94.39 kPa (0.96 kg·cm², 13.7 psi), continue evacuating for 15 minutes.
10. After evacuating for 15 minutes, close both manifold pressure valves and stop the vacuum pump. Disconnect the hose from the vacuum pump. The system is now ready for charging.



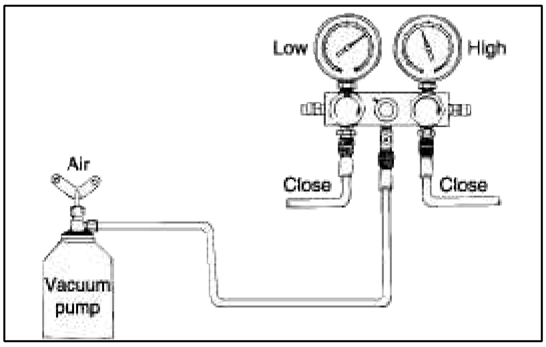
HANDLING THE REFRIGERANT SERVICE TAP VALVE

1. Before connecting the valve to the refrigerant container, turn the handle fully counterclockwise.
2. Turn the disc counterclockwise until it reaches its highest position.
3. Connect the center hose to the valve fitting. Turn the disc fully clockwise by hand.
4. Turn the handle clockwise to make a hole in the sealed top.
5. Loosen the center hose nut connected to the center fitting of the manifold gauge.
6. Allow air to escape for a few seconds, and then tighten the nut.

CHARGING REFRIGERANT SYSTEM (VAPOR)

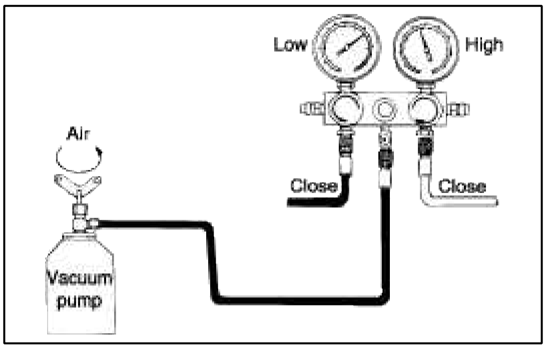
NOTE

This step is to charge the system through the low pressure side with the refrigerant in a vapor state. When the refrigerant container is placed upright, refrigerant will enter the system as a vapor.



1. Install the refrigerant can tap valve as described in Handling the Refrigerant Tap Valve section.
2. Open the low pressure valve. Adjust the valve so that the low pressure gauge does not read over 412 kPa (4.2 kg·cm², 60 psi).
3. Put the refrigerant in a pan of warm water (about 40°C or 104°F) to keep vapor pressure in the container slightly higher than vapor pressure in the system.

4. Run the engine at fast idle and operate the air conditioning.



NOTE

Be sure to keep the container upright to prevent liquid refrigerant from being charged into the system through the suction side, resulting in possible damage to the compressor.

5. Charge the system to the specified amount. Then close the low pressure valve.

Specified amount : 550±25g

6. When refrigerant charging speed is slow, immerse the refrigerant can in heated water. (a temperature of approx. 40°C (104°F)).

WARNING

- Under any circumstances, the refrigerant must not be warmed in water heated to a temperature of over 52°C (126°F).
- A blow torch or stove must never be used to warm up the can.

CHARGING THE REFRIGERANT SYSTEM (LIQUID)

NOTE

This step is to charge an empty system through the high pressure side with refrigerant in a liquid state. When the refrigerant container is held upside down, refrigerant will enter the system as a liquid.

CAUTION

Never run the engine when charging the system through the high pressure side. Do not open the low pressure valve when the system is being charged with liquid refrigerant.

1. Close both high and low pressure valves completely after the system is evacuated.
2. Install the refrigerant can tap valve as described in "Handling the Refrigerant Service Tap Valve" section.
3. Open the high pressure valve fully and keep the container upside down.
4. Charge the system to the specified amount by weighing the refrigerant with a scale. Overcharging will cause discharge pressure (high side) to rise. Then, close the high pressure valve.

Specified amount : 550±25g

5. After the specified amount of refrigerant has been charged into the system, close the manifold gauge valve.
6. Confirm that there are no leaks in the system by checking with a leak detector. Refer to Checking for Refrigerant Leak.

NOTE

Conducting a performance test prior to removing the manifold gauge is good service practice.

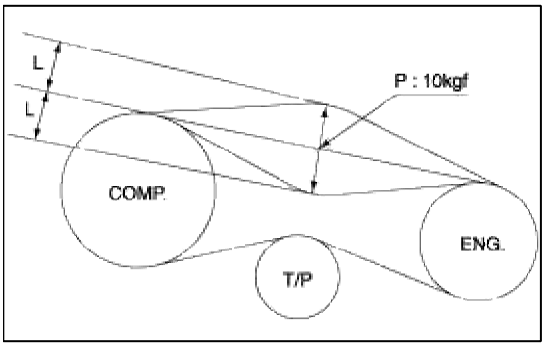
CHECKING FOR REFRIGERANT LEAKS

Always conduct a leak test with an electronic leak detector whenever leakage or refrigerant is suspected and when conducting service operations which are accompanied by disassembly or loosening or connection fittings.

1. Check the torque on the connection fittings and, if too loose, tighten to the proper torque. Check for gas leakage with a leak detector.
2. If leakage continues even after the fitting has been tightened, discharge the refrigerant from the system, disconnect the fittings, and check their seating faces for damage. Always replace, even if the damage is slight.
3. Check the compressor oil and add oil if required.
4. Charge the system and recheck for gas leaks. If no leaks are found, evacuate and charge the system again.

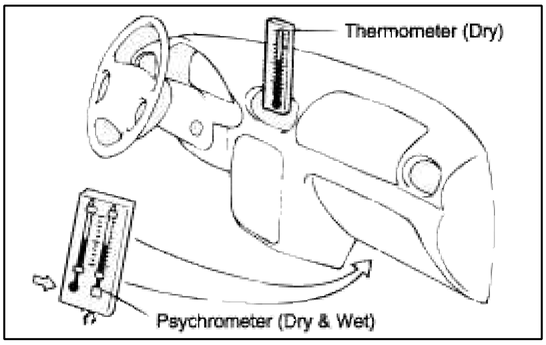
AMOUNT OF DEFLECTION OF BELT

Item	Deflection L (mm)
New one	5~5.5
Used one	6~7
After driving	8



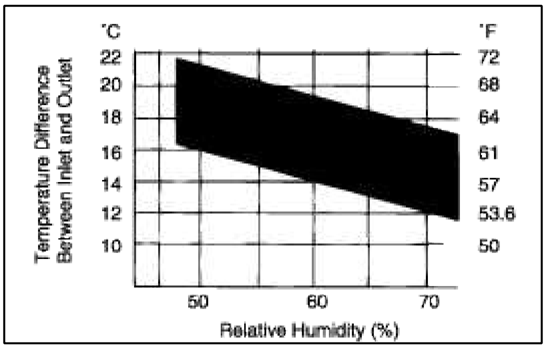
PERFORMANCE TEST

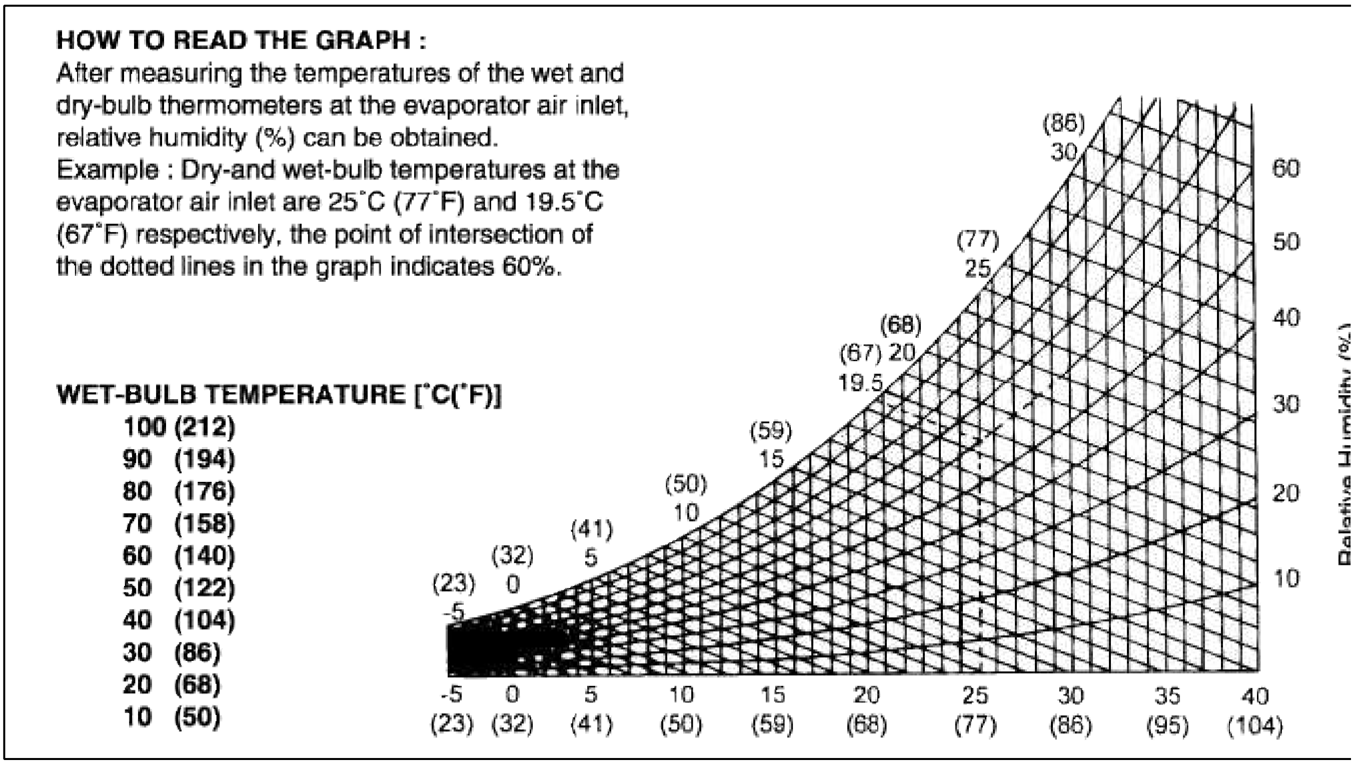
1. Install the manifold gauge set.
2. Run the engine at 2,000 rpm and set the controls for maximum cooling and high blower speed.
3. Keep all windows and doors open.
4. Place a dry-bulb thermometer in the cool air outlet.
5. Place a psychrometer close to the inlet of the cooling unit.
6. Check that the reading on the high pressure gauge is 1,373-1,575 kPa (14-16kg·cm², 199-228 psi). If the reading is too high, pour water on the condenser. If the reading to too low, cover the front of the condenser.



7. Check that the reading on the dry-bulb thermometer at the air inlet is 25~35°C (77~95°F).
8. Calculate the relative humidity from the psychrometric graph by comparing the wet-and dry-bulb reading of the psychrometer at the air inlet.
9. Measure the dry-bulb temperature at the cool air outlet, and calculate the difference between the inlet dry-bulb and outlet dry-bulb temperatures.

10. Check that the intersection of the relative humidity and temperature difference is within the block hard line. If the intersection is within the block hard line, cooling performance is satisfactory.





HOW TO READ THE GRAPH :

After measuring the temperatures of the wet and dry-bulb thermometers at the evaporator air inlet, relative humidity (%) can be obtained.

Example : Dry-and wet-bulb temperatures at the evaporator air inlet are 25˚C (77˚F) and 19.5˚C (67˚F) respectively, the point of intersection of the dotted lines in the graph indicates 60%.

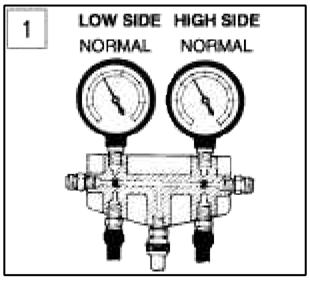
WET-BULB TEMPERATURE [˚C(˚F)]

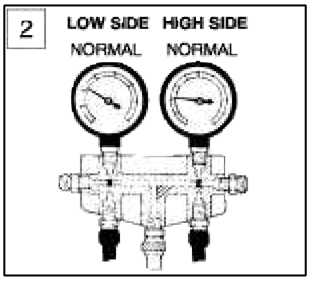
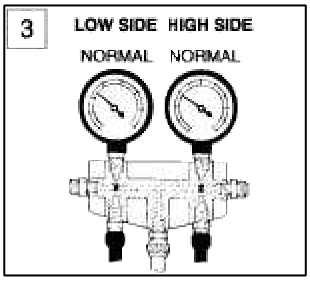
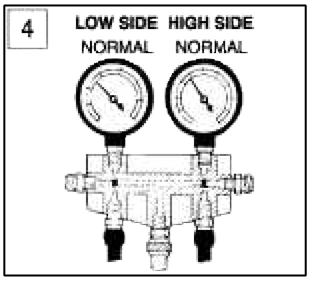
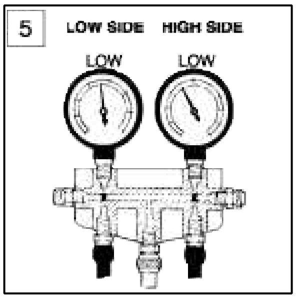
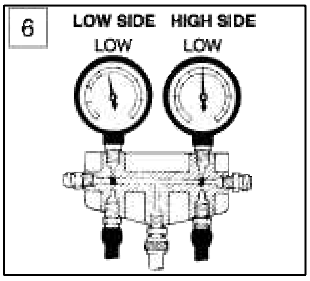
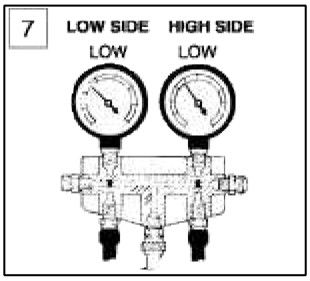
100	**(212)**
90	**(194)**
80	**(176)**
70	**(158)**
60	**(140)**
50	**(122)**
40	**(104)**
30	**(86)**
20	**(68)**
10	**(50)**

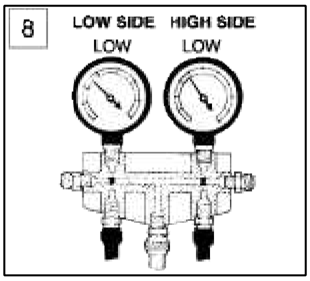
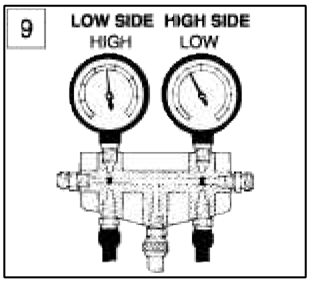
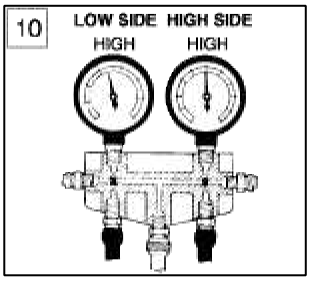
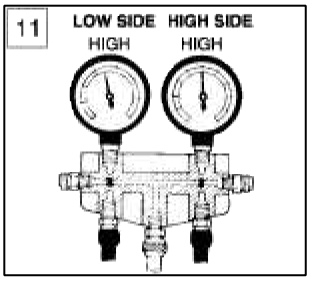
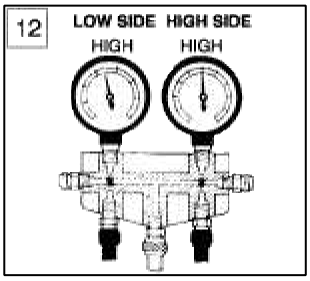
(86)
30
(77)
25
(68)
(67) 20
19.5
(59)
15
(50)
10
(41)
5
(32)
0
(23)
-5
60
50
40
30
20
10
Relative Humidity (%)
-5 (23)
0 (32)
5 (41)
10 (50)
15 (59)
20 (68)
25 (77)
30 (86)
35 (95)
40 (104)

Heating,Ventilation, Air Condioning > Air conditioning System > Troubleshooting

DIAGNOSIS

GAUGE READINGS	OTHER SYMPTOMS	DIAGNOSIS	CORRECTION
 1 LOW SIDE NORMAL HIGH SIDE NORMAL	• Discharge air : slightly cool. • Thermostatic switch (with thermistor) : Low side gauge doesn't fluctuate with "ON" and "OFF".	Some air and moisture in system.	• Check for leaks. • Discharge refrigerant from system. • Repair leaks as located. • Evacuate the system for at least 30 minutes. • Charge system with refrigerant. • Operate system and check performance.

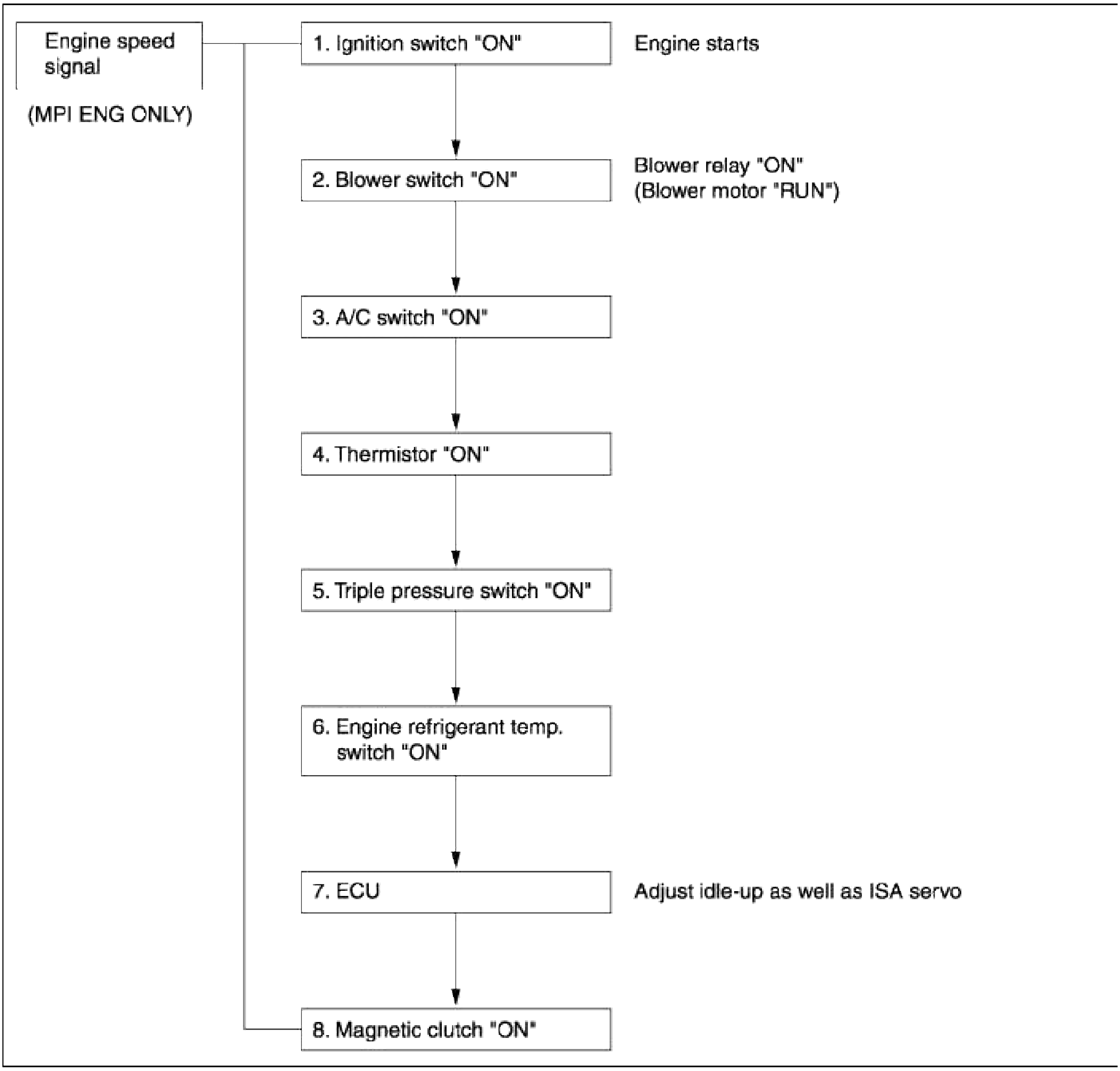
 2 LOW SIDE HIGH SIDE NORMAL NORMAL	• Discharge air : Becomes warm all the time during hot part of day.	Some air and moisture in system.	• Discharge refrigerant. • Evacuate system with a vacuum pump. • Recharge system to proper capacity. • Operate system and check performance.
 3 LOW SIDE HIGH SIDE NORMAL NORMAL	• Compressor : Cycles on and off too fast.	Defective thermostatic switch.	• Replace thermostatic switch. • Operate system and check performance.
 4 LOW SIDE HIGH SIDE NORMAL NORMAL	• Compressor : Low side pressure builds too high before compressor turns on (cycle "ON" point too high).	Faulty thermostatic switch.	• Replace the thermostatic switch. • Operate system and check performance.
 5 LOW SIDE HIGH SIDE LOW LOW	• Discharge air : Slightly cool.	System slightly low on refrigerant.	• Check for leaks. • Discharge refrigerant. • Repair leaks. • Evacuate system using a vacuum pump. • Charge system with refrigerant. • Operate system and check performance.
 6 LOW SIDE HIGH SIDE LOW LOW	• Discharge air : Warm	• System very low on refrigerant. • Possible leak in system.	• Check for leaks. • Discharge refrigerant. • Evaporate system using a vacuum pump. • Charge system with refrigerant. • Operate system and check performance.
 7 LOW SIDE HIGH SIDE LOW LOW	• Discharge air : Slightly cool. • Expansion valve : Frost build up.	• Expansion valve stuck. • Screen plugged. • Sensing bulb malfunction.	• Discharge system. • Disconnect inlet line at expansion valve and remove and inspect screen. • Replace screen and reconnect inlet line. • Evacuate system using a vacuum pump.

			• Charge system with refrigerant.
 8 LOW SIDE HIGH SIDE LOW LOW	• Discharge air : Slightly cool. • High side pipe : Cool and also shows moisture or frost.	Restriction in high side of system	• Discharge system. • Evacuate system using a vacuum pump. • Charge system with refrigerant. • Operate system and check performance.
 9 LOW SIDE HIGH SIDE HIGH LOW	• Compressor : Noisy	Compressor malfunction	• Disassemble compressor. • Inspect compressor. • Check compressor oil level. • Operate system and check performance.
 10 LOW SIDE HIGH SIDE HIGH HIGH	• Discharge air : Warm • High side pipe : Very hot	• Faulty condenser. • Overcharged.	• Check for loose or worn fan belt. • Inspect condenser for clogged air passage. • Check for refrigerant overcharge. • Operate system and check performance.
 11 LOW SIDE HIGH SIDE HIGH HIGH	• Discharge air : Slightly cool.	Large amount of air and moisture.	• Discharge refrigerant from system. • Evacuate system using vacuum pump. • Charge system with refrigerant. • Operate system and check performance.
 12 LOW SIDE HIGH SIDE HIGH HIGH	• Discharge air : Warm • Evaporator : Moisture or frost.	Expansion valve stuck.	• Discharge system. • Replace expansion valve. • Evacuate system using vacuum pump, then recharge system with refrigerant. • Operate system and check performance.

Heating,Ventilation, Air Condioning > Air conditioning System > Compressor > Description and Operation

OPERATION

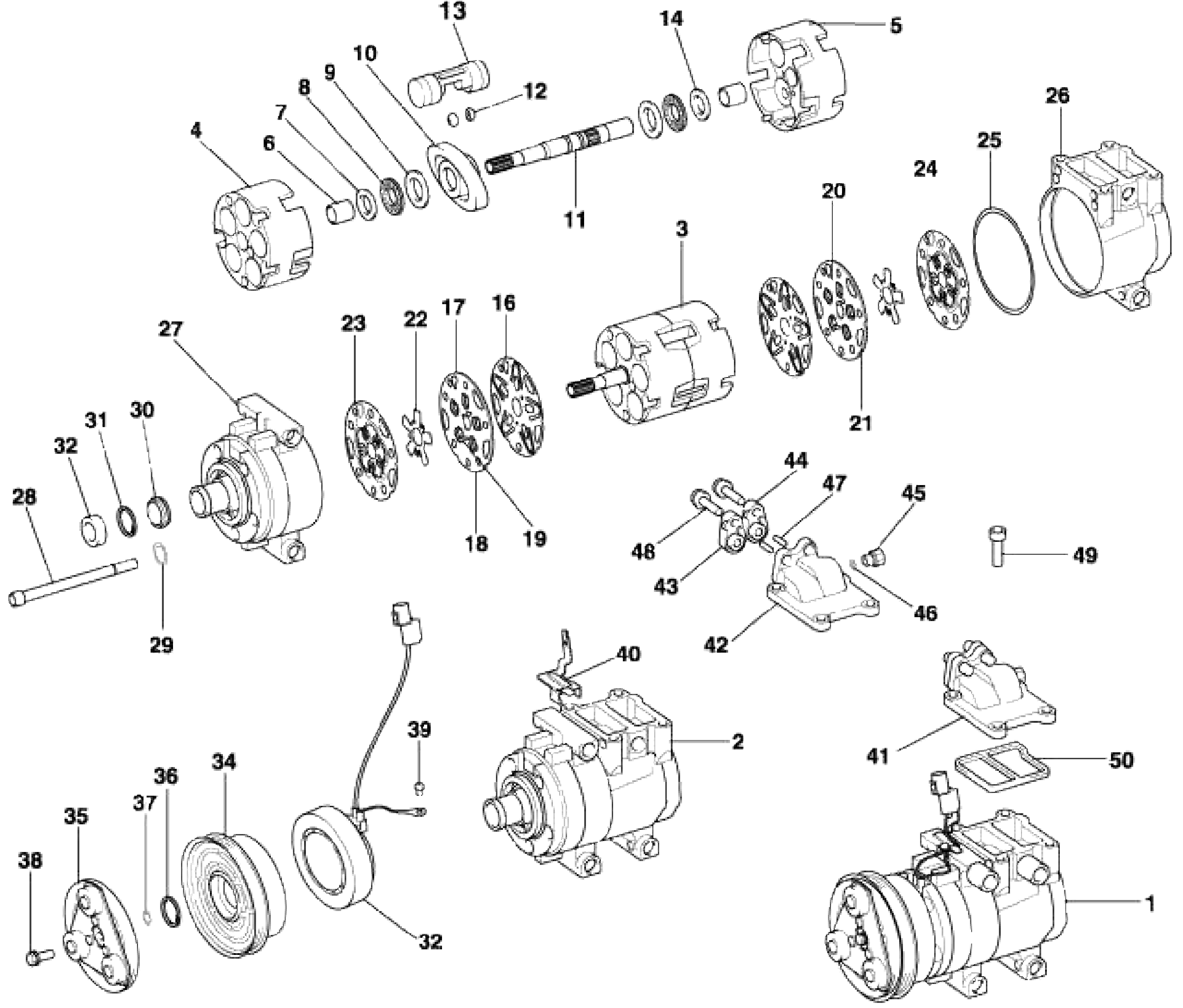
MAGNETIC CLUTCH


Engine speed signal
(MPI ENG ONLY)
1. Ignition switch "ON"
Engine starts
2. Blower switch "ON"
Blower relay "ON"
(Blower motor "RUN")
3. A/C switch "ON"
4. Thermistor "ON"
5. Triple pressure switch "ON"
6. Engine refrigerant temp. switch "ON"
7. ECU
Adjust idle-up as well as ISA servo
8. Magnetic clutch "ON"

Heating,Ventilation, Air Condioning > Air conditioning System > Compressor > Components and Components Location

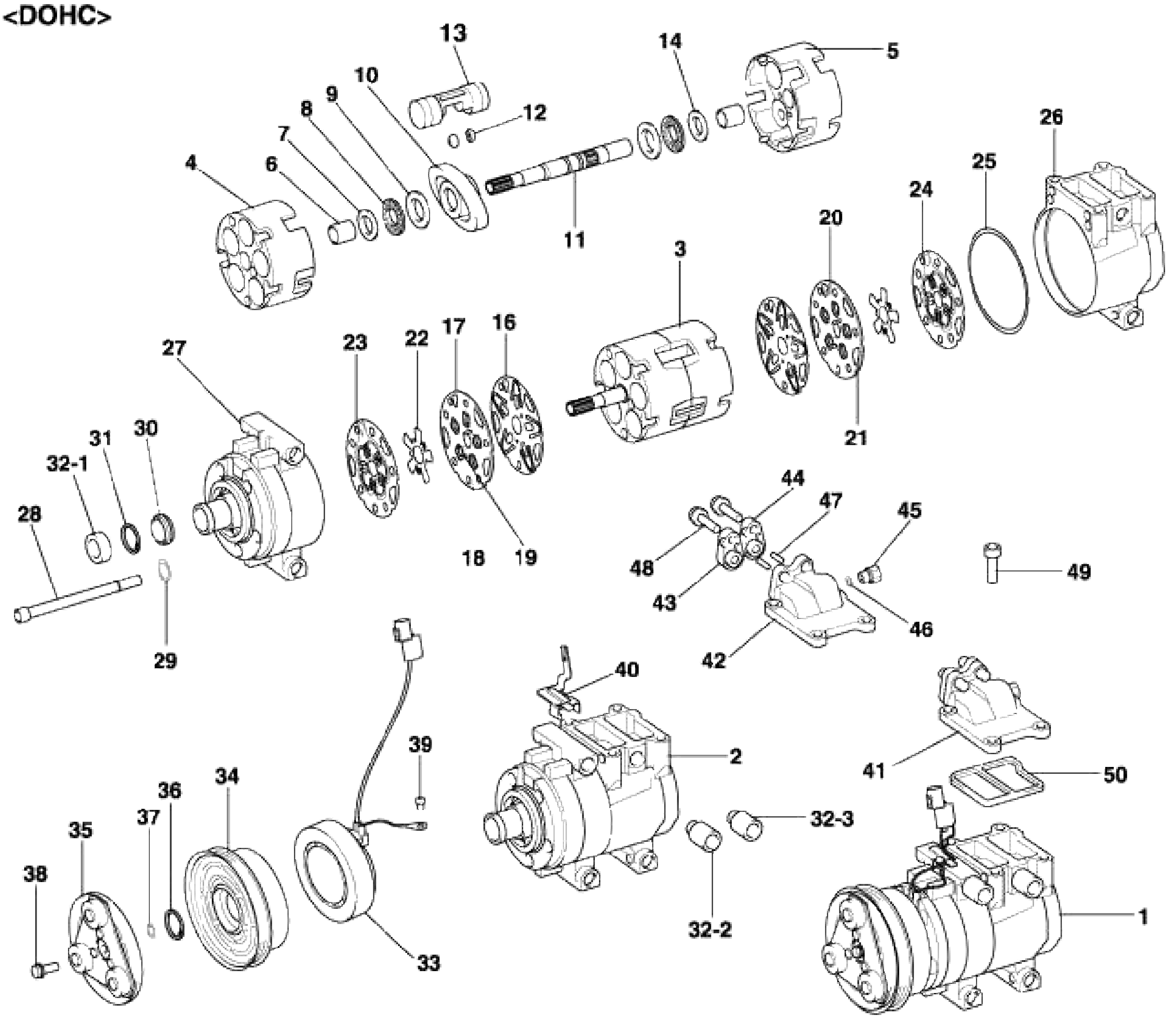
COMPONENTS

<SOHC>


13
14
5
10
9
12
8
26
7
25
4
6
24
20
11
3
27
23
22
17
16
31
30
32
21
28
44
47
45
18
19
48
49
43
46
29
42
40
39
2
36
34
41
50
37
35
38
1
32

1. Compressor & clutch assembly
2. Compressor assembly
3. Cylinder & shaft assembly
4. Front cylinder
5. Rear cylinder
6. Bushing
7. Thrust bearing race A~K
8. Thrust bearing
9. Thrust bearing race L
10. Swash plate
11. Shaft
12. Shoe
13. Piston
14. Thrust bearing race E
15. Pin spring
16. Inlet reed
17. Front plate assembly
18. Front plate
19. Pin
20. Rear plate assembly
21. Rear plate
22. Discharge reed
23. Front gasket
24. Rear gasket
25. O-ring
26. Rear head
27. Front head
28. Bolt
29. Flat washer
30. Shaft seal
31. Retainer ring
32. Seal felt
33. Field coil
34. Pulley
35. Disc & hub
36. Retainer ring
37. Spacer
38. Bolt
39. Screw
40. Connector bracket
41. Manifold assembly
42. Manifold
43. Suction cap
44. Discharge cap
45. Relief valve
46. O-ring
47. Pin knurling
48. Flange head bolt
49. Bolt wrench
50. Gasket

<DOHC>

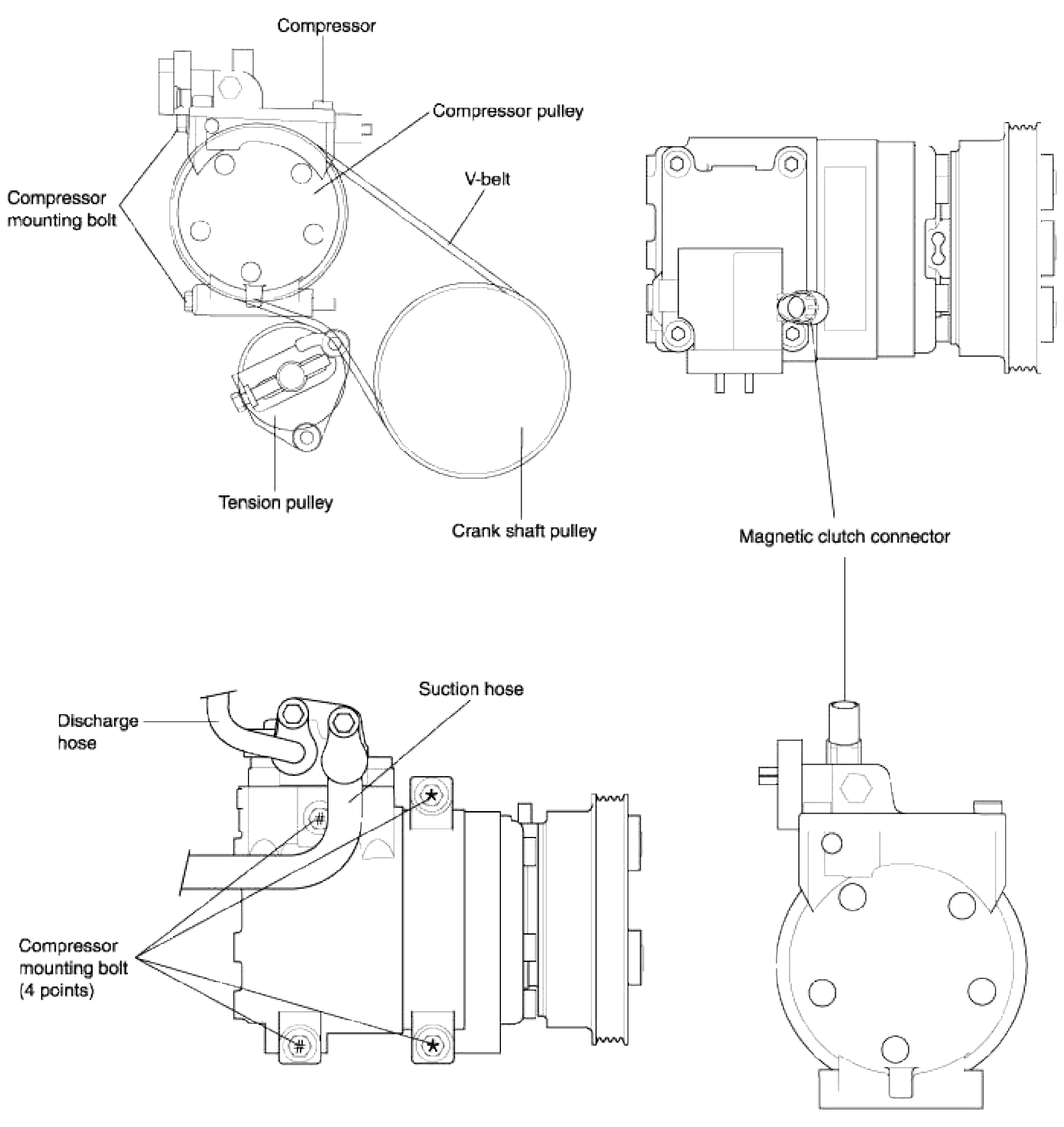

13
14
5
10
9
8
12
26
7
4
6
25
24
11
20
3
27
23
22
17
16
21
31
30
32-1
28
44
47
45
18
19
48
49
43
46
29
42
40
39
2
36
34
41
50
37
35
32-3
38
1
32-2
33

1. Compressor & clutch assembly
2. Compressor assembly
3. Cylinder & shaft assembly
4. Front cylinder
5. Rear cylinder
6. Bushing
7. Thrust bearing race A~K
8. Thrust bearing
9. Thrust bearing race L
10. Swash plate
11. Shaft
12. Shoe
13. Piston
14. Thrust bearing race E
15. Pin spring
16. Inlet reed
17. Front plate assembly
18. Front plate
19. Pin
20. Rear plate assembly
21. Rear plate
22. Discharge reed
23. Front gasket
24. Rear gasket
25. O-ring
26. Rear head
27. Front head
28. Bolt
29. Flat washer
30. Shaft seal
31. Retainer ring

32-1 . Seal felt
32-2 . Mounting spacer
32-3 . Mounting spacer

33. Field coil
34. Pulley
35. Disc & hub
36. Retainer ring
37. Spacer
38. Bolt
39. Screw
40. Connector bracket
41. Manifold assembly
42. Manifold
43. Suction cap
44. Discharge cap
45. Relief valve
46. O-ring
47. Pin knurling
48. Flange head bolt
49. Bolt wrench
50. Gasket

COMPRESSOR CONFIGURATION


Compressor
Compressor pulley
V-belt
Compressor mounting bolt
Tension pulley
Crank shaft pulley
Magnetic clutch connector
Suction hose
Discharge hose
Compressor mounting bolt (4 points)

CAUTION

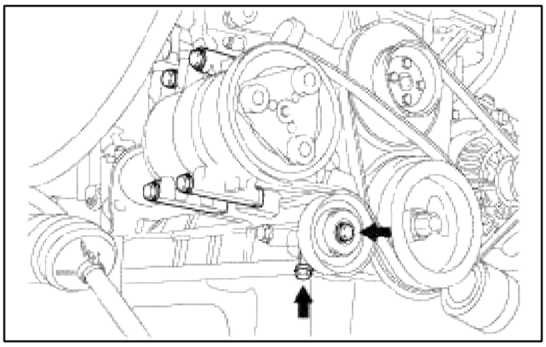
'   ' Marked bolt should be tightened first.

Heating,Ventilation, Air Condioning > Air conditioning System > Compressor > Repair procedures

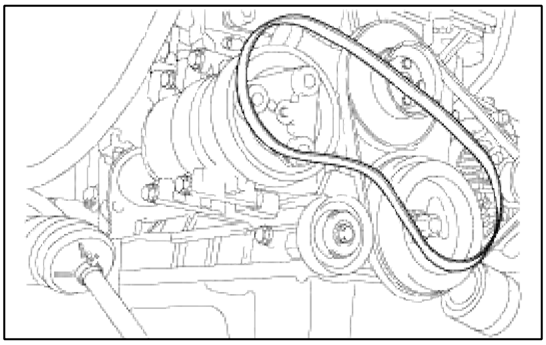
REMOVAL

1. Discharge the refrigerant.

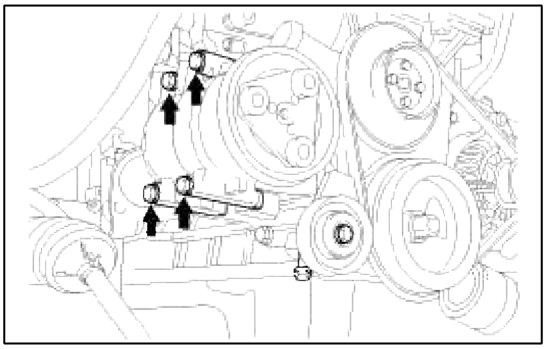
2. Remove the tension bolt.



3. Remove the V-belt.



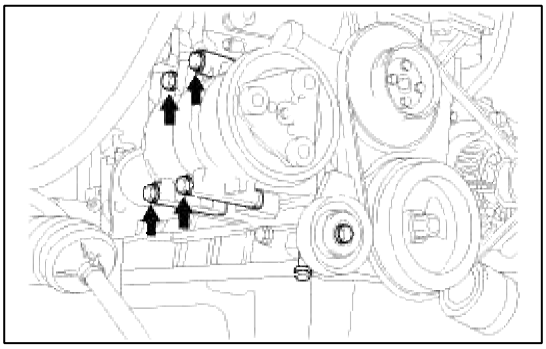
4. Remove the suction hose and discharge hose from the compressor.
5. Remove the 4 mounting bolts on the compressor.



6. Remove the compressor downwards.

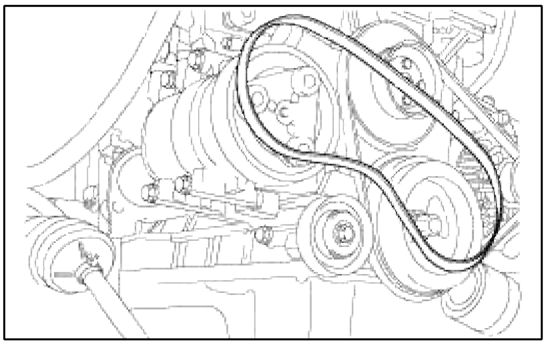
INSTALLATION

1. Tighten the 4 compressor mounting bolts.



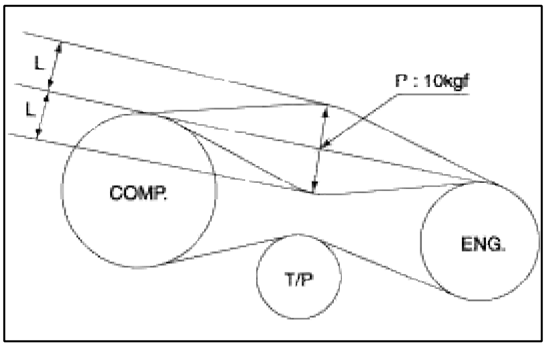
2. Connect the suction hose and discharge hose to the compressor.

3. Connect the V belt.



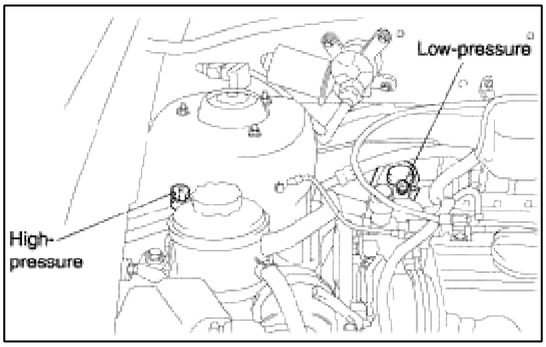
4. Adjust the V belt tension.

Item	Deflection L (mm)
New one	5~5.5
Used one	6~7
After driving	8


L
L
P : 10kgf
COMP.
ENG.
T/P

5. Supply the coolant.

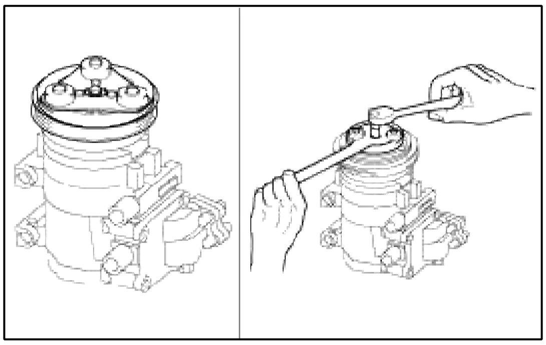
Specified amount : 550 ± 25g


Low-pressure
High-pressure

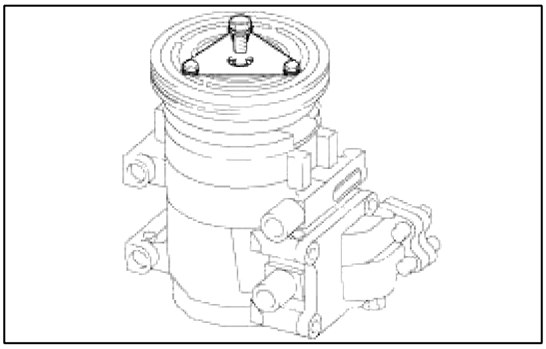
DISASSEMBLY

CLUTCH HUB AND PULLEY

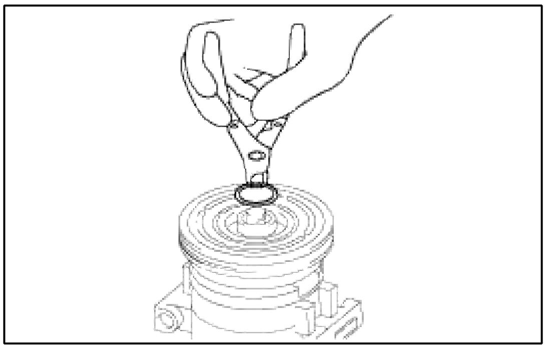
1. Remove the clutch hub supporting bolt using a spanner wrench.



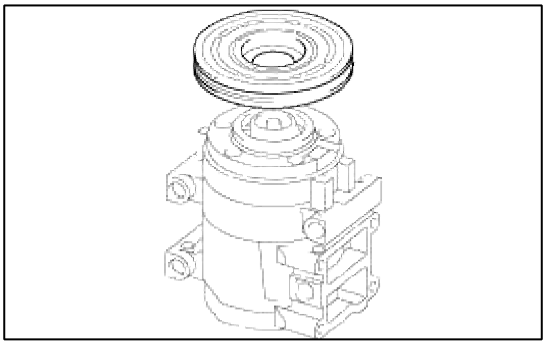
2. Pull out the clutch hub and shim from the compressor shaft. If it is hard to pull out, insert a 8mm bolt into the shaft hole to remove the hub from the shaft.



3. Remove the pulley supporting the snap ring.



4. Remove the pulley and bearing assembly from the compressor.



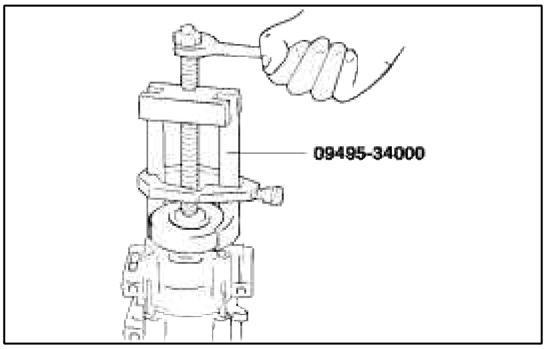
CLUTCH FIELD COIL

1. Remove the clutch hub and pulley.
2. Install a shaft protection tool at the compressor opening.
3. Install the pulley at the compressor.
   Place the puller screw end at the shaft protectors center concave and the puller projection around the rear side field coil.

4. Turn the puller screw using a wrench and remove the coil.

CAUTION

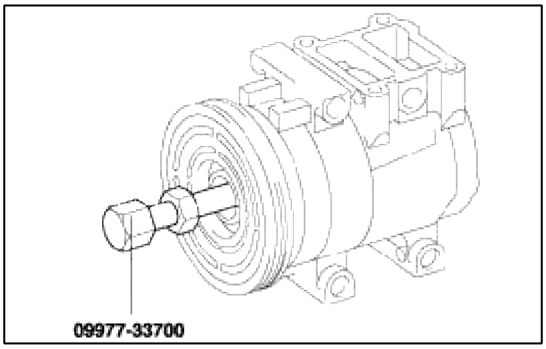
Do not use air tools.

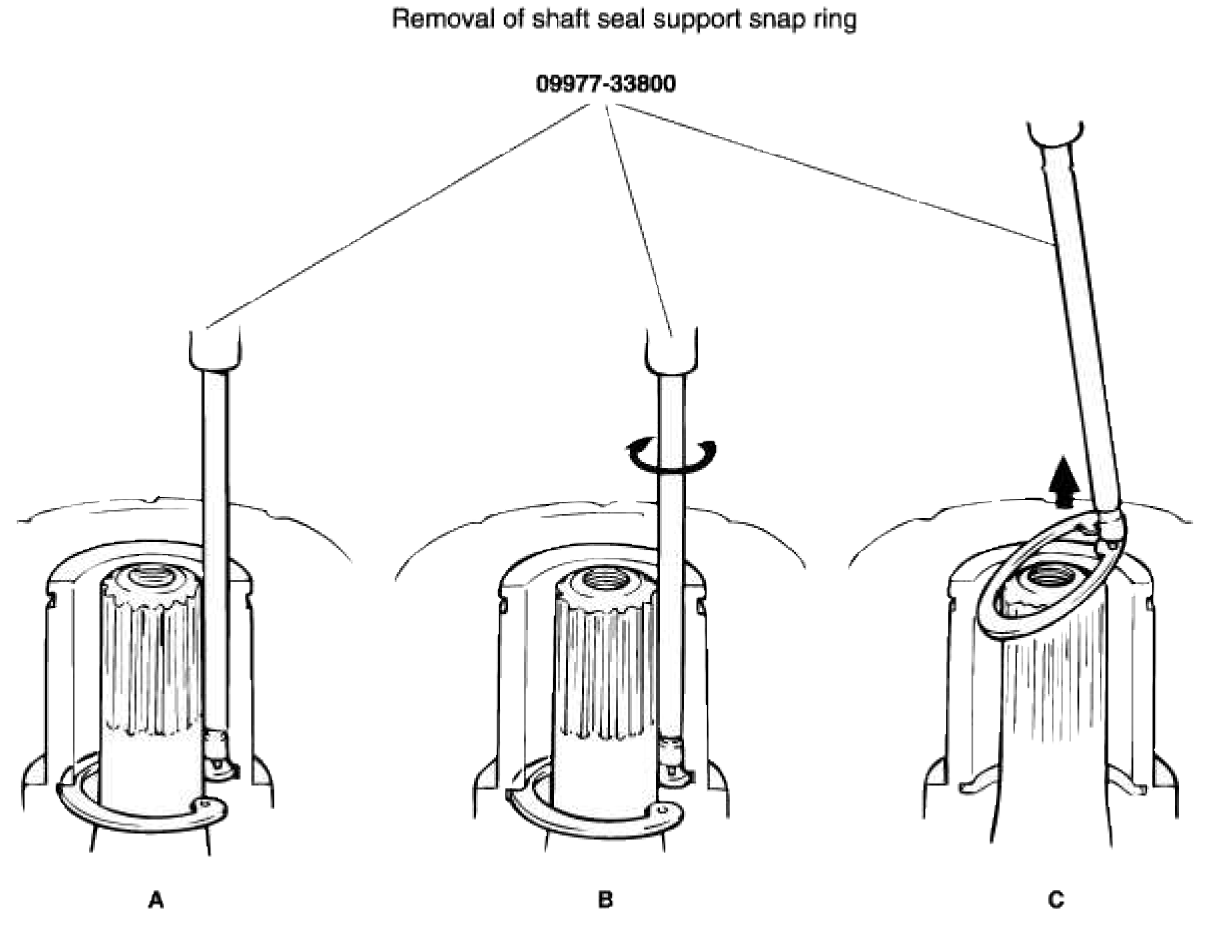


SHAFT SEAL

Prior to replacement of the compressor shaft, remove the compressor from the vehicle and discharge the refrigerant.

1. Remove the clutch hub from the compressor.
2. Remove the shaft seal felt from the nose of the compressor with a pick type tool.
3. Blow any debris from inside the compressor nose with low pressure compressed air. Then, clean the inside and outside nose area of the compressor with a lint-free cloth to remove any oil and dirt.
4. Using a snap ring remover, remove the shaft seal support snap ring out of the compressor nose.
    (1) Insert tip of the snap ring remover into one of the snap ring eyes (View A).
    (2) Rotate the snap ring remover to position the tool tip and snap ring eye closest to the compressor shaft (View B).
    (3) Pull the snap ring remover tool up quickly while keeping the tool shaft against the side of the nose opening to remove the snap ring (View C).
5. Position the shaft seal remover tool (09977-33700) over the compressor shaft and push the tool into the nose of t compressor and down against the shaft seal. Engage the end of the tool with the internal diameter of the shaft seal. While holding the hex part of the tool, turn the tool handle clockwise to expand the tool tip inside the seal inner radius. Then, pull the shaft seal from the compressor with the tool

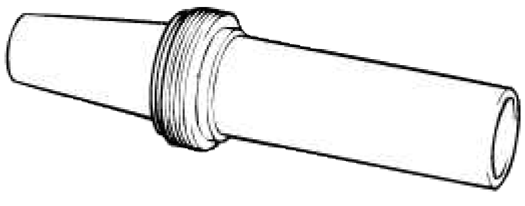




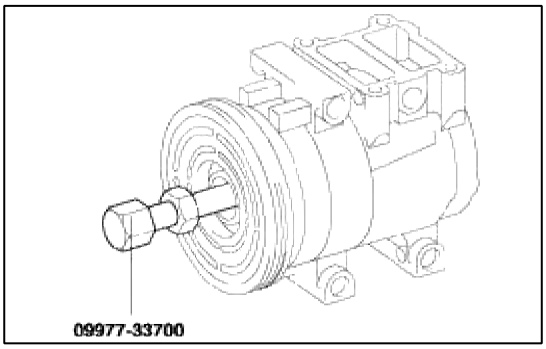
REASSEMBLY

SHAFT SEAL

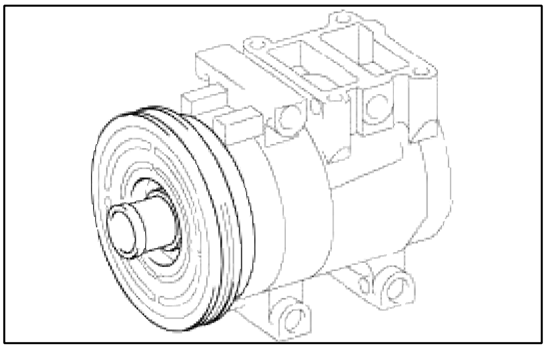
1. Obtain a new shaft seal kit. Carefully remove the contents from the package and locate the plastic shaft seal protector. Inspect the protector for any burrs or other damage. Do not use the protector if it is damaged. Obtain another shaft seal kit and use the protector from it.
2. Using a clean lint-free cloth, clean the shaft and the seal pocket inside the compressor nose.
3. Dip the shaft seal protector and seal in clean refrigerant oil and position the seal on the protector with the lip of the seal pointing toward the large end of the protector.



4. Place the seal protector with shaft seal over the end of the compressor shaft.



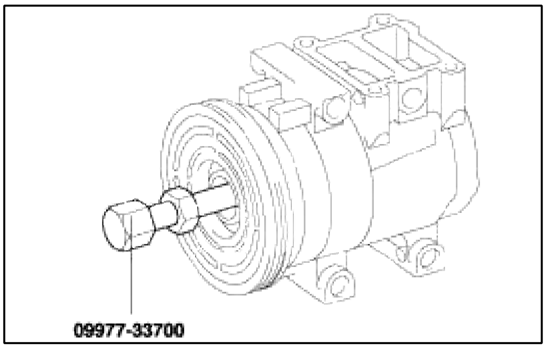
5. Place the shaft seal installer tool over the end of the shaft seal protector. Then, slowly push the shaft seal down the protector until it is seated in the compressor.



6. Remove the seal installer and seat protector from the compressor.
7. Place a new seal retaining snap ring into the compressor nose opening and seat the snap ring into the groove with the remover tool.
8. Leak test the shaft seal installation after rotating the shaft about 10 revolutions with the clutch hub.
9. Install a new felt into the compressor nose.
10. Install the clutch hub on the compressor as outlined in this section.

CLUTCH FIELD COIL

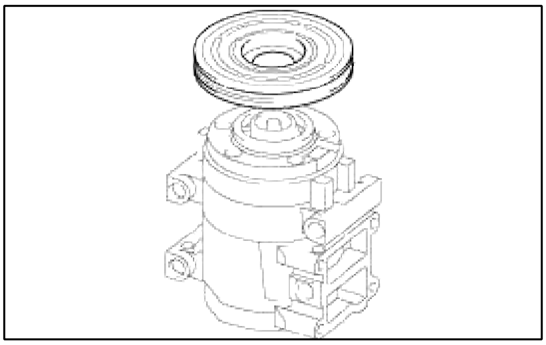
1. Clean the front head coil mounting portion.
2. Place the compressor vertically and put the coil in position of compressor front head.
   Check the electric connector of clutch coil is located in position.
3. Place the coil compression tool in the compressor nose and the center of field coil.
4. Place two 8 inch pullers on the compressor and compression tool. The jaws of puller should deeply hold the front mounting portion of compressor, then the screw should be located in the central position of the compression tool.
5. Using a wrench, tighten the screw so as to securely seat the coil on the compressor front head.
6. Install the clutch pulley and hub on the compressor.



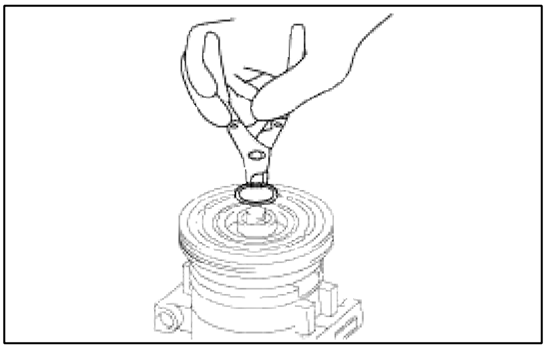
CLUTCH HUB AND PULLEY

1. Clean the pulley bearing surface of the compressor head and remove dirt and rust.

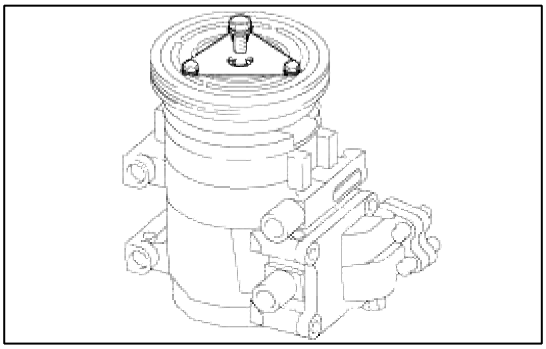
2. Install the pulley and bearing on the compressor.



3. Install the snap ring with the bevelled side facing outward.



4. Place shim of specified side at the hub spline opening inside and slide the hub onto the compressor shaft end.

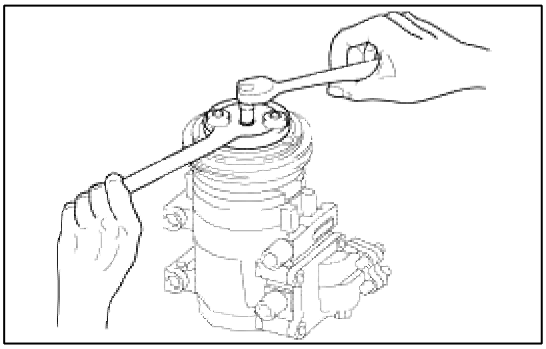


5. Install a new hub supporting bolt on the compressor shaft end. Tighten the bolt to the specified torque.

Tightening torque : 110~140kg·cm

CAUTION

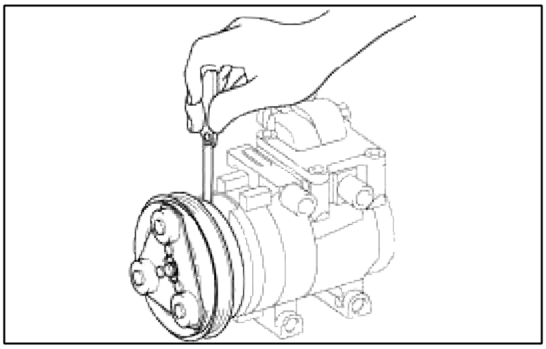
Do not use air tools.



6. Check clutch air gap between the clutch hub and the pulley contact surface using a filler gauge.

Clutch air gap : 0.05~0.08mm

Check gaps around the pulley at 3 points.

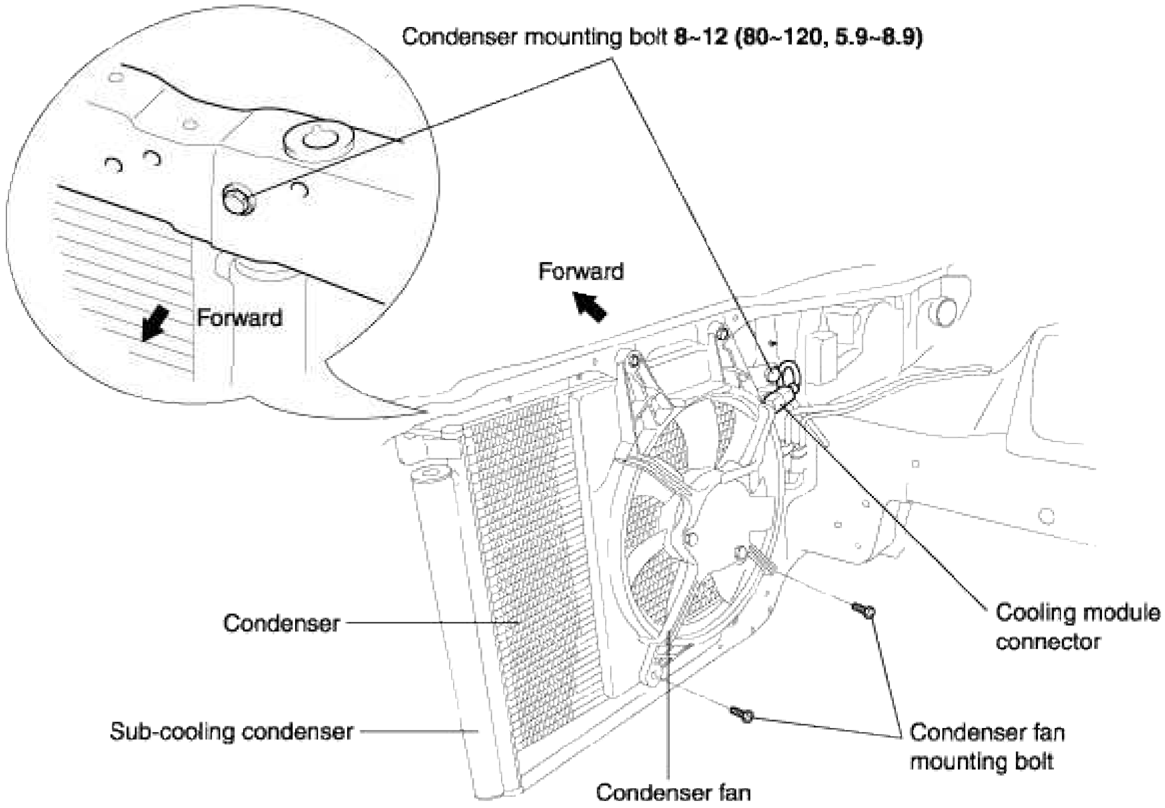


7. If the clutch air gap is outside the normal range, correct the air gap into the normal range using a shim of the proper size.

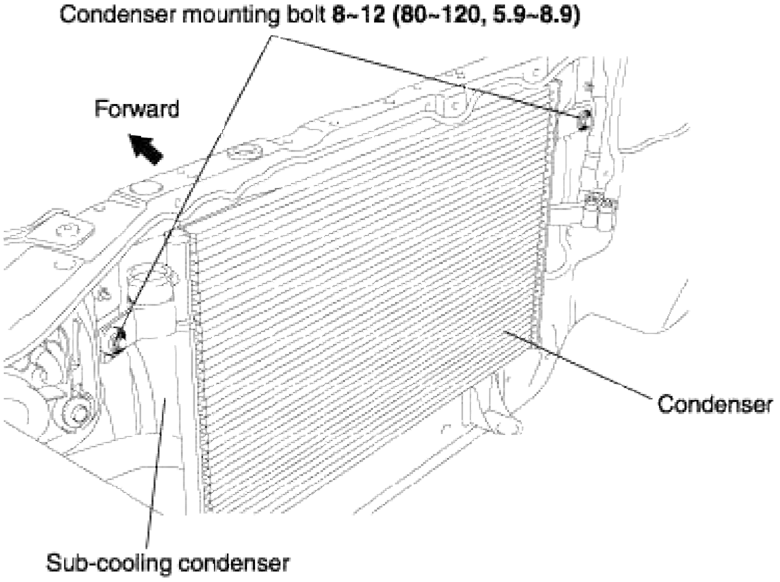
Heating,Ventilation, Air Condioning > Air conditioning System > Condenser > Components and Components Location

COMPONENTS

[M/T]


Condenser mounting bolt 8~12 (80~120, 5.9~8.9)
Forward
Forward
Condenser
Sub-cooling condenser
Cooling module connector
Condenser fan mounting bolt
Condenser fan

[A/T]

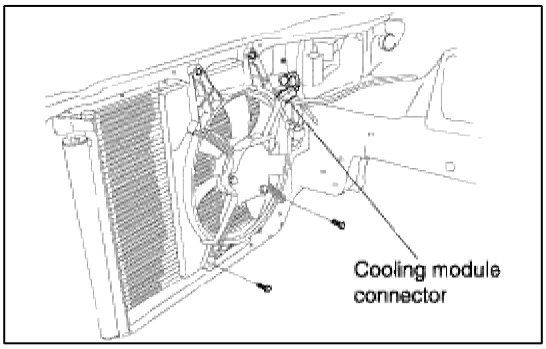

Condenser mounting bolt 8~12 (80~120, 5.9~8.9)
Forward
Condenser
Sub-cooling condenser

TORQUE : Nm (kgf·cm, lbf·ft)

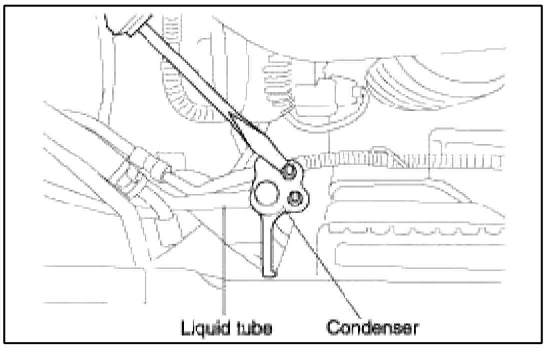
Heating,Ventilation, Air Condioning > Air conditioning System > Condenser > Repair procedures

REMOVAL

1. Remove the cooling module connector.

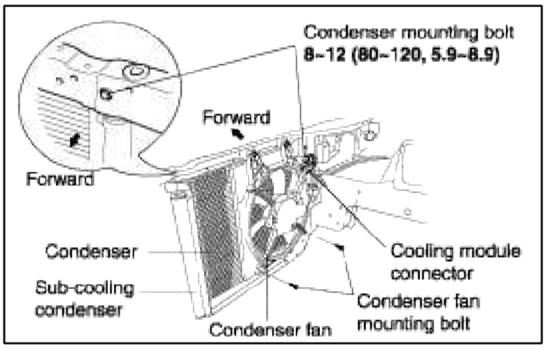

Cooling module
connector

2. Remove the cooling module (condenser fan).
3. Remove the liquid tube nut.


Liquid tube
Condenser

4. Remove the condenser mounting bolts (2).

Tightening torque : 8~12Nm


Condenser mounting bolt
8~12 (80~120, 5.9~8.9)
Forward
Forward
Condenser
Sub-cooling
condenser
Condenser fan
Cooling module
connector
Condenser fan
mounting bolt

5. Remove the condenser upward by pressing the radiator backward the vehicle.

INSTALLATION

Installation is the reverse of removal.

INSPECTION

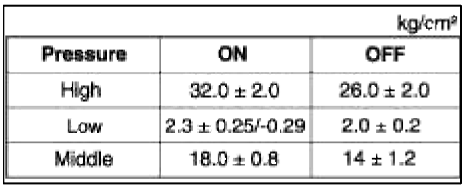
1. Check condenser pin for clogging and damage. If clogged, clean it with water, and blow it with compressed air. If bent, gently stretch it using a screwdriver or pliers.
2. Check the condenser connection area for leakage, and repair or replace if required.

Heating,Ventilation, Air Condioning > Air conditioning System > Triple pressure switch > Description and Operation

OPERATION

The triple switch is a combination of a middle switch as well as conventional low pressure and high pressure switches. The low pressure switch will turn off to stop compressor operation if refrigerant pressure is low. The high pressure switch will turn off to stop compressor operation if refrigerant pressure is too high. The middle switch will it turn on at a medium level pressure to determine the A/C system is overheating. It will cool the A/C system by operating the radiator fan and the condenser fan at high speed.

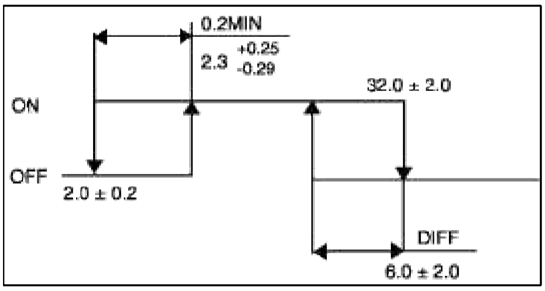
OPERATING CHARACTERISTIC



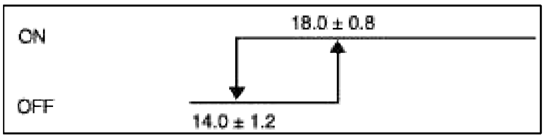
kg/cm²

Pressure	ON	OFF
High	32.0 ± 2.0	26.0 ± 2.0
Low	2.3 ± 0.25/-0.29	2.0 ± 0.2
Middle	18.0 ± 0.8	14 ± 1.2

LOW & HIGH

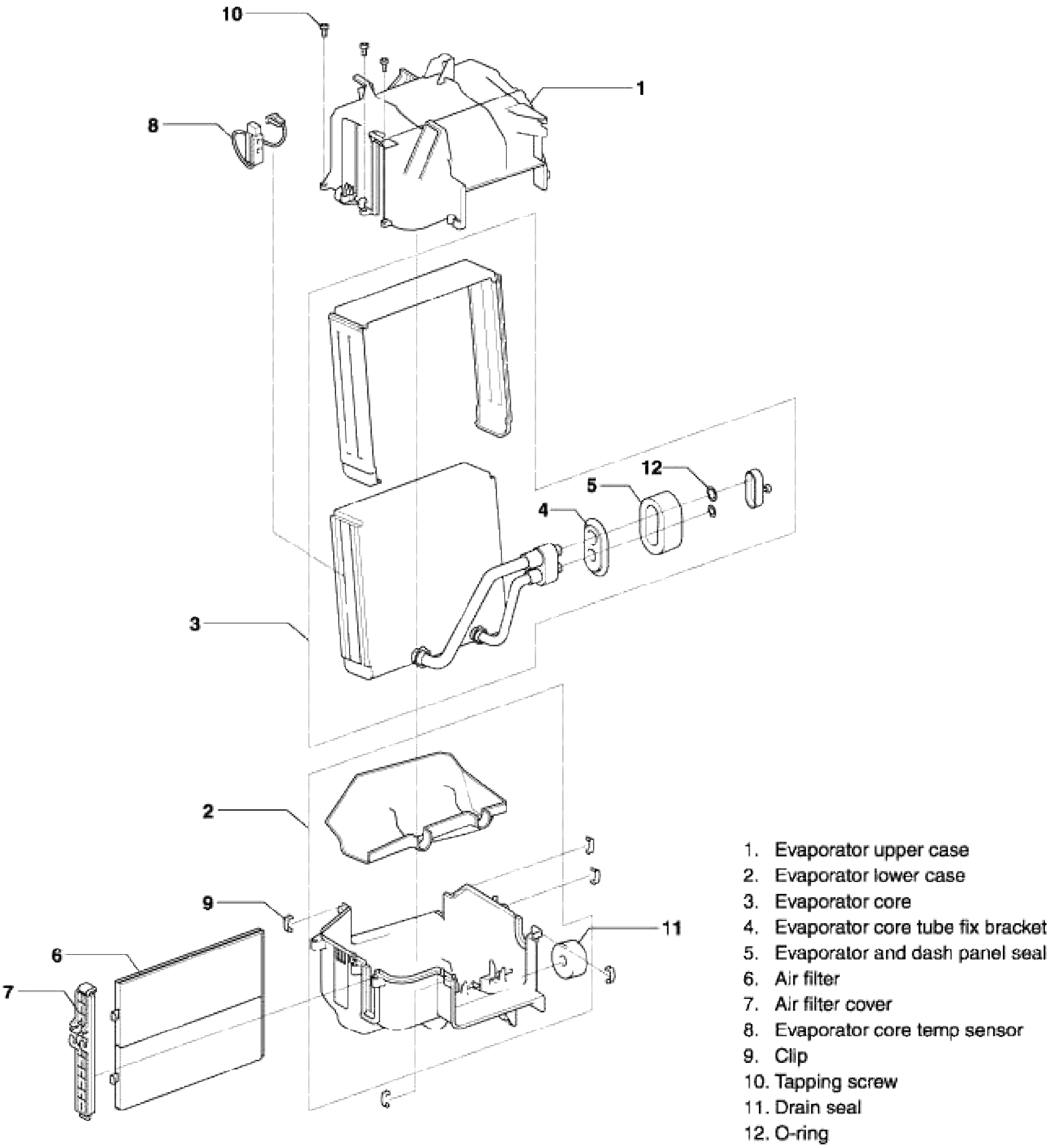

0.2MIN
2.3 +0.25 -0.29
32.0 ± 2.0
ON
OFF
2.0 ± 0.2
DIFF
6.0 ± 2.0

MIDDLE


ON
18.0 ± 0.8
OFF
14.0 ± 1.2

Heating,Ventilation, Air Condioning > Air conditioning System > Evaporator unit > Components and Components Location

COMPONENTS



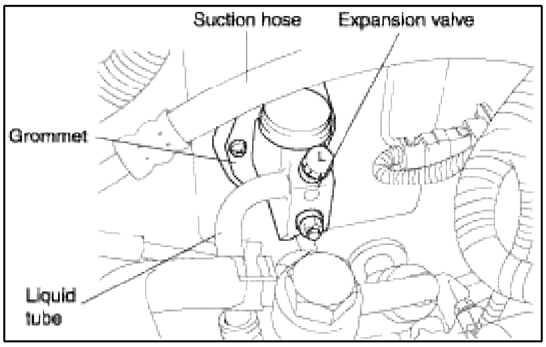
1. Evaporator upper case
2. Evaporator lower case
3. Evaporator core
4. Evaporator core tube fix bracket
5. Evaporator and dash panel seal
6. Air filter
7. Air filter cover
8. Evaporator core temp sensor
9. Clip
10. Tapping screw
11. Drain seal
12. O-ring

Heating,Ventilation, Air Condioning > Air conditioning System > Evaporator unit > Repair procedures

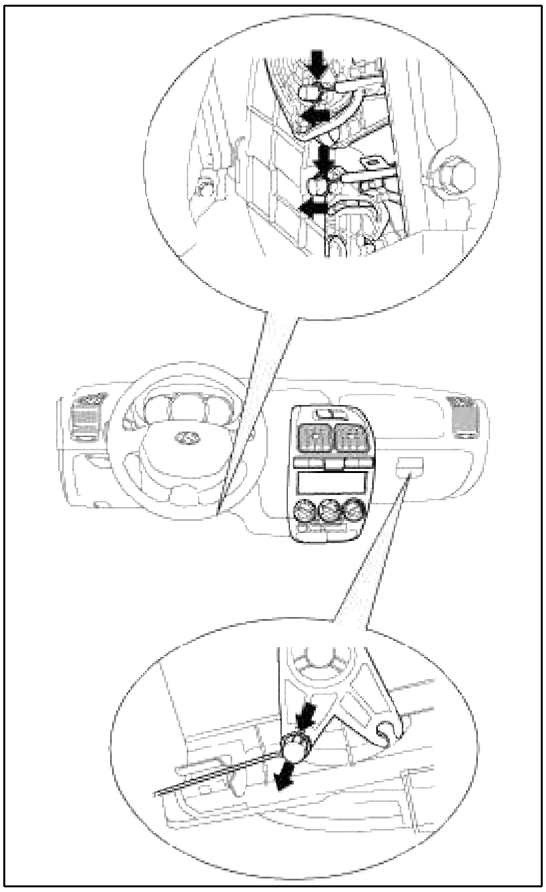
REMOVAL

1. Discharge the refrigerant.

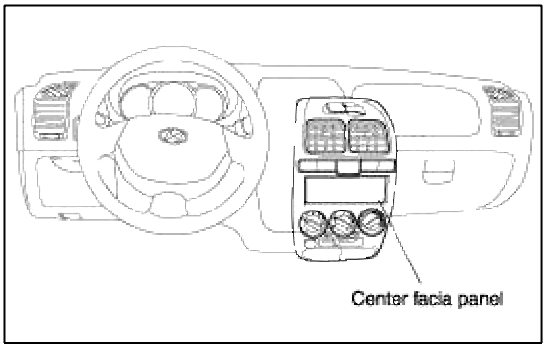
2. Remove the air conditioner suction hose, liquid tube and grommet.


Suction hose
Expansion valve
Grommet
Liquid tube

3. Remove the 2 control cables of heater side and one control cable of blower side.

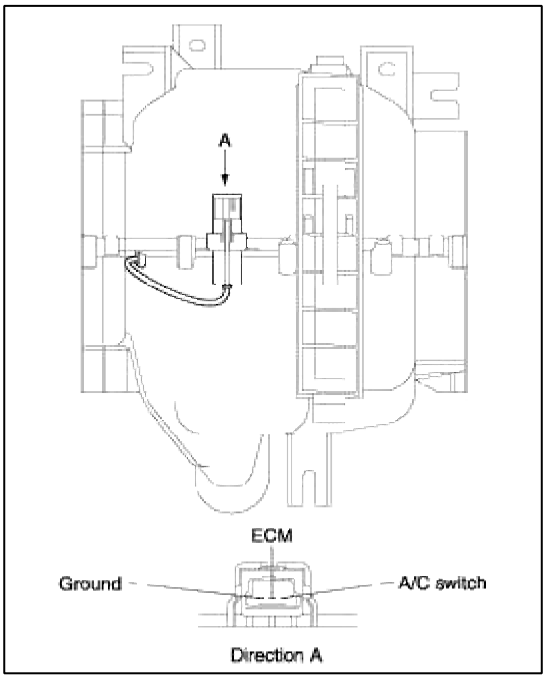


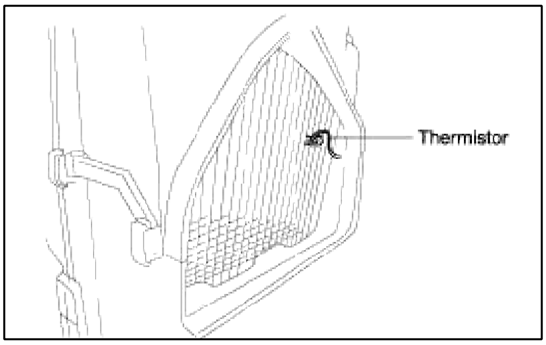
4. Remove the center facia panel from the lower portion.


Center facia panel

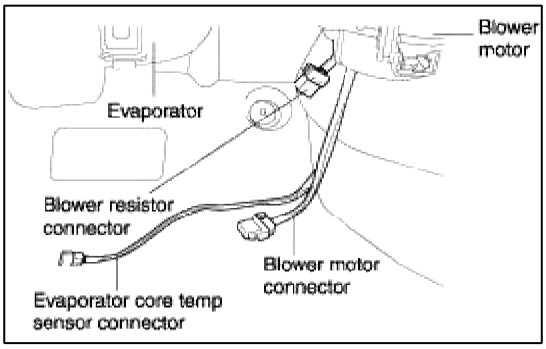
5. Disconnect the switch connectors and remove the center facia panel.
6. Loosen the mounting bolts on the main crash pad and remove the main crash pad. (Refer to "CRESH PAD" of BD group)

7. Remove the evoporator core temp sensor (thermistor) connector.

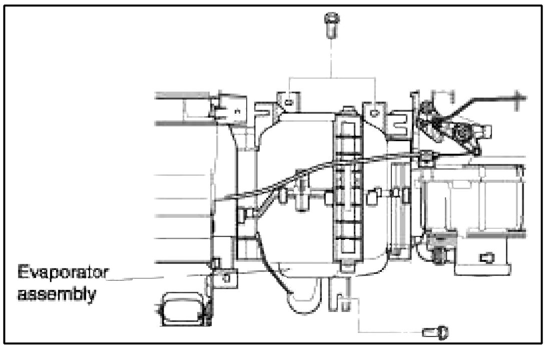

A
ECM
Ground
A/C switch
Direction A


Thermistor

8. Disconnect the blower resistor and blower motor connector.


Blower motor
Evaporator
Blower resistor connector
Blower motor connector
Evaporator core temp sensor connector

9. Remove the evaporator assembly.


Evaporator assembly

INSTALLATION

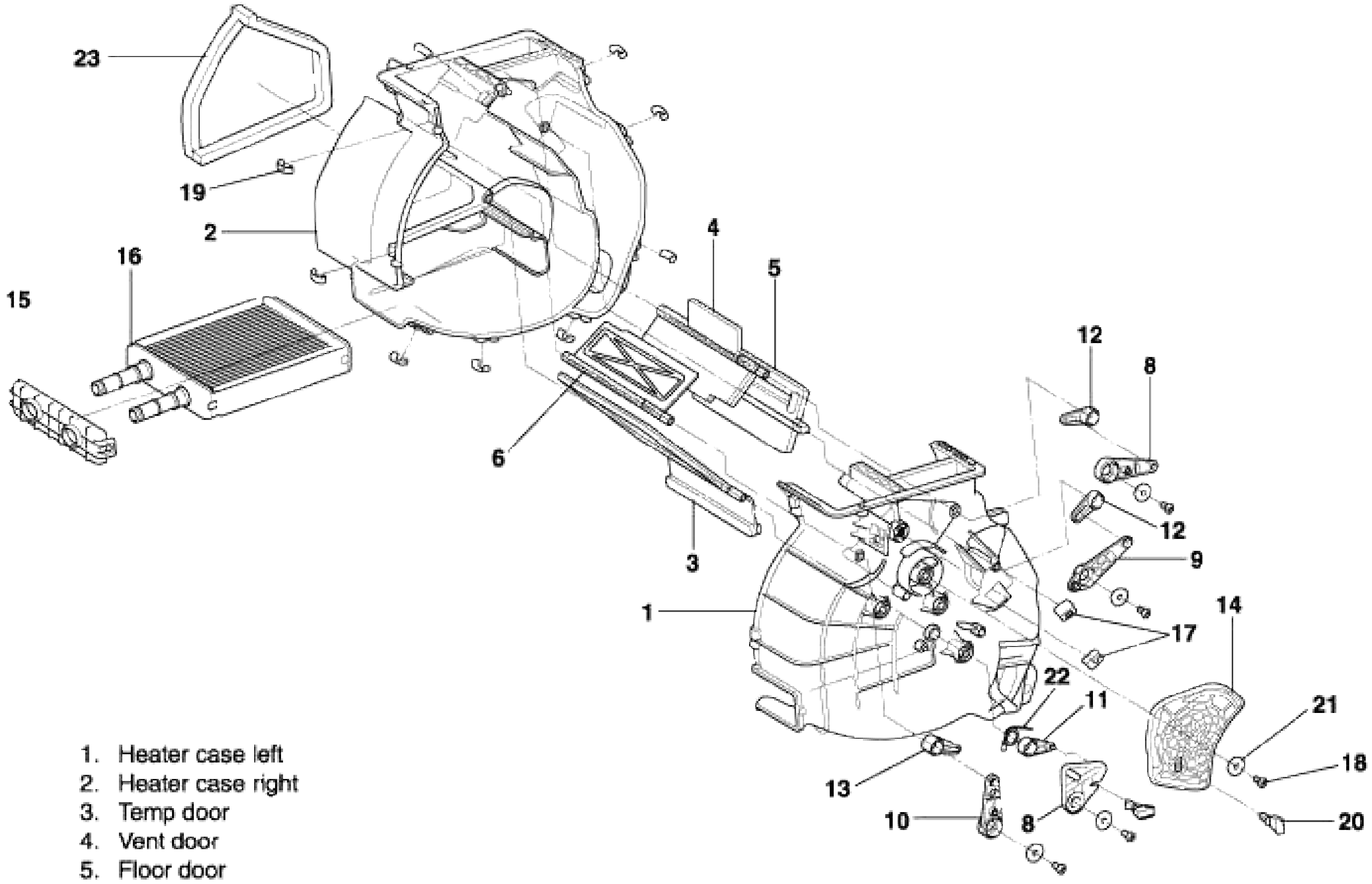
Installation is the reverse of removal.

DISASSEMBLY AND REASSEMBLY

Refer to "COMPONENTS".

Heating,Ventilation, Air Condioning > Heater > Heater Unit > Components and Components Location

COMPONENTS

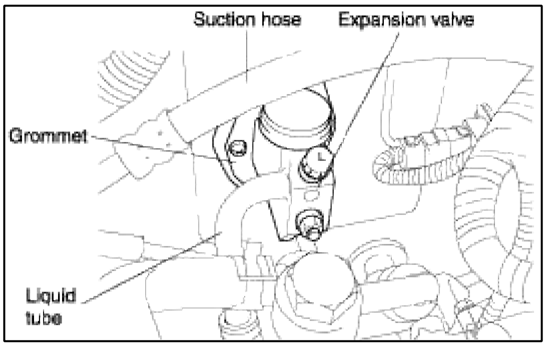


1. Heater case left
2. Heater case right
3. Temp door
4. Vent door
5. Floor door
6. Defrost door
7. Temp door lever
8. Vent door lever
9. Floor door lever
10. Defrost door lever
11. Temp door arm
12. Vent door arm
13. Defrost door arm
14. Mode cam
15. Heater core cover
16. Heater core & seal
17. Control cable clamp
18. Tapping screw
19. Clip
20. Door location key
21. Spring washer
22. Torsion spring
23. Seal

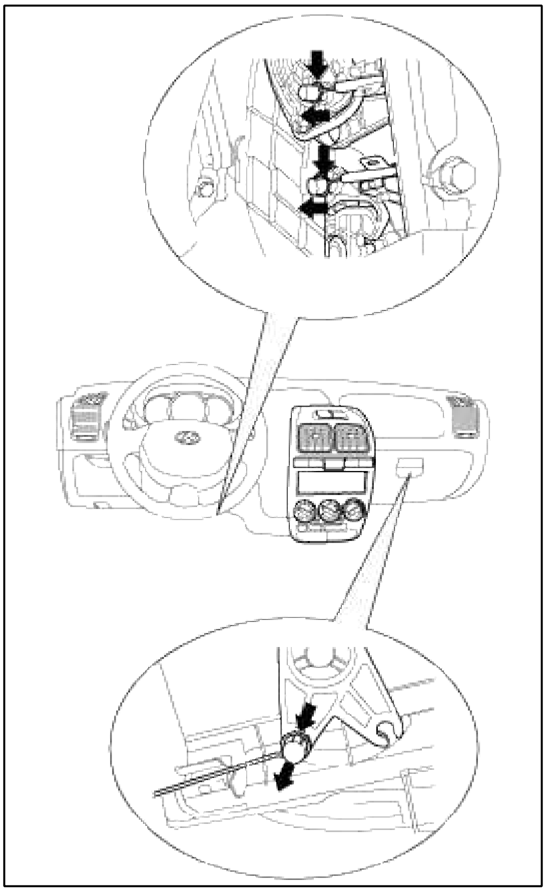
Heating,Ventilation, Air Condioning > Heater > Heater Unit > Repair procedures

REMOVAL

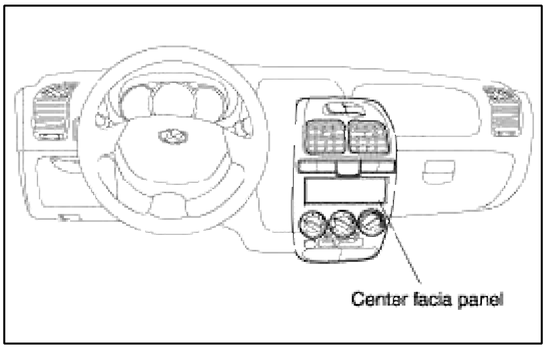
1. Disconnect the (-)negative battery terminal.
2. Drain the coolant of the radiator.
3. Remove the A/C suction hose, liquid tube and grommet.


Suction hose
Expansion valve
Grommet
Liquid tube

4. Remove the 2 heater side control cables and one blower side control cable.

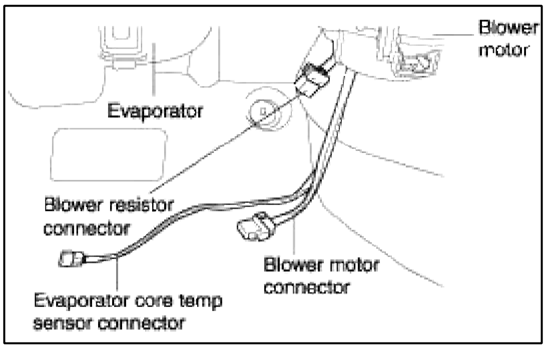


5. Remove the center facia panel from the lower portion.

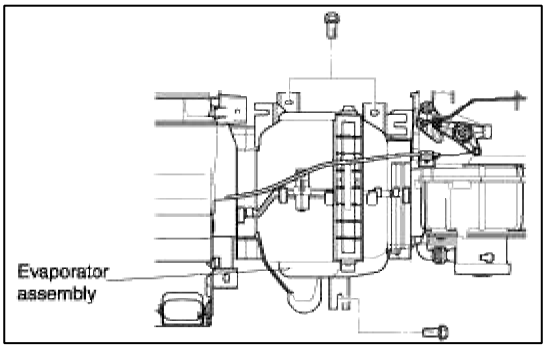

Center facia panel

6. Disconnect the switch connectors and remove the center facia panel.
7. After removing the mounting bolts, remove the main crash pad. (Refter to "CRASH PAD" of BD group)

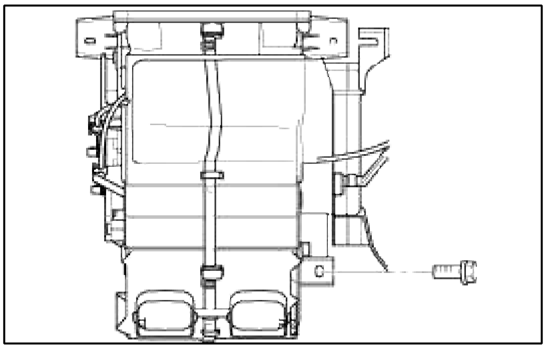
8. Disconnect the evaporator core temp sensor (thermister), blower resistor connector, and blower motor connector.


Blower motor
Evaporator
Blower resistor connector
Blower motor connector
Evaporator core temp sensor connector

9. Remove the evaporator unit.

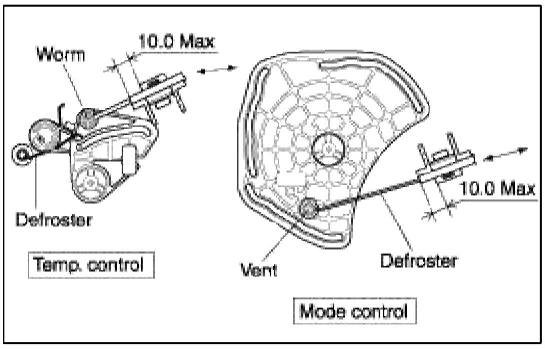

Evaporator assembly

10. Remove the heater assembly.



INSTALLATION

Installation is the reverse of removal. (Prior to installation of temp. control and mode control cables, first install the locating pin.)


Worm
10.0 Max
Defroster
Temp. control
10.0 Max
Vent
Defroster
Mode control

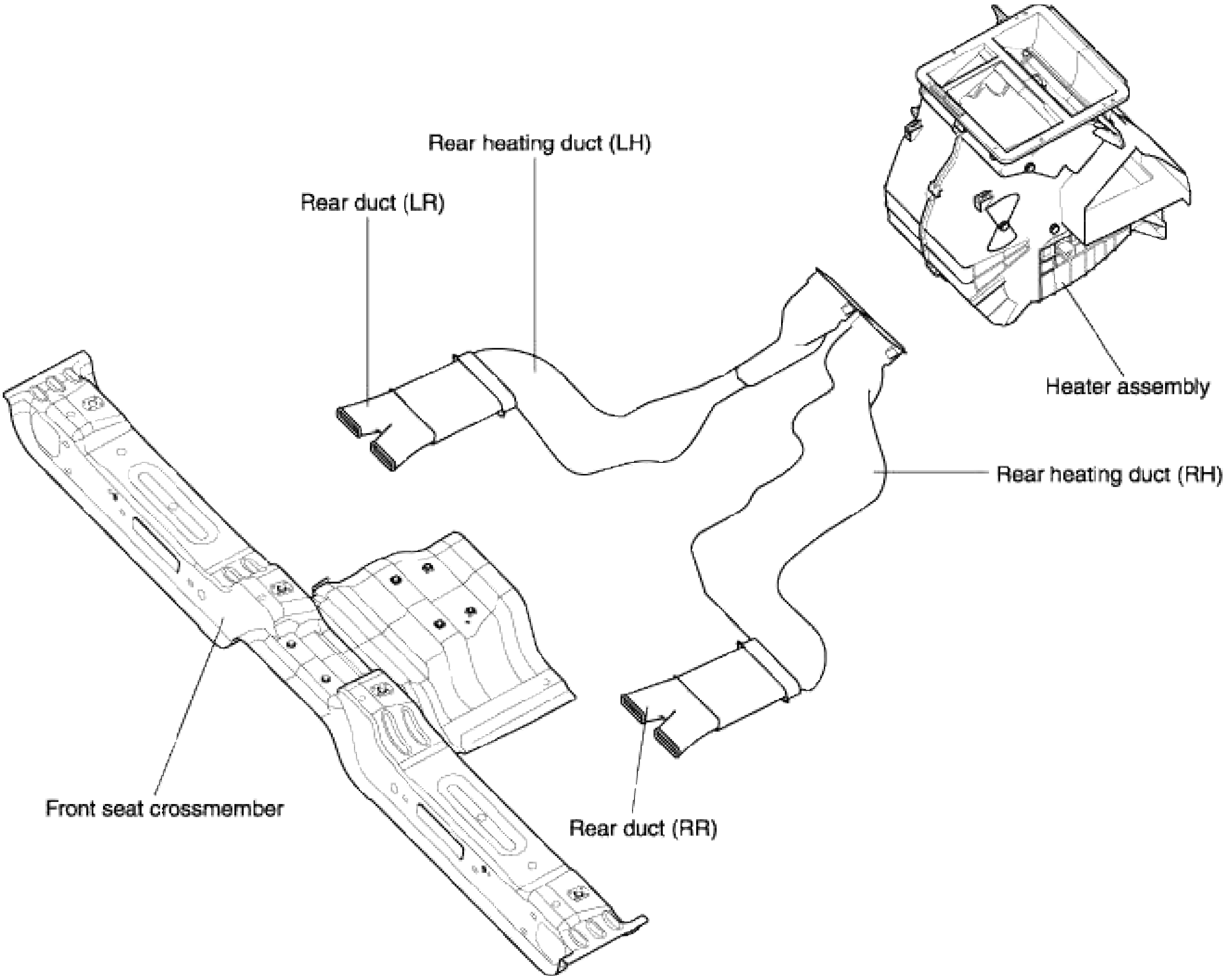
DISASSEMBLY AND REASSEMBLY

Refer to "COMPONENTS" for disassembly and reassembly. When installing and reassembling the temp. control and mode control cable, refer to the following chart.

Condition	Lever load	
	Temp. control cable	Mode control cable
Blower : 12V Mode : ALL	Max 2.0kgf	Max 2.0kgf

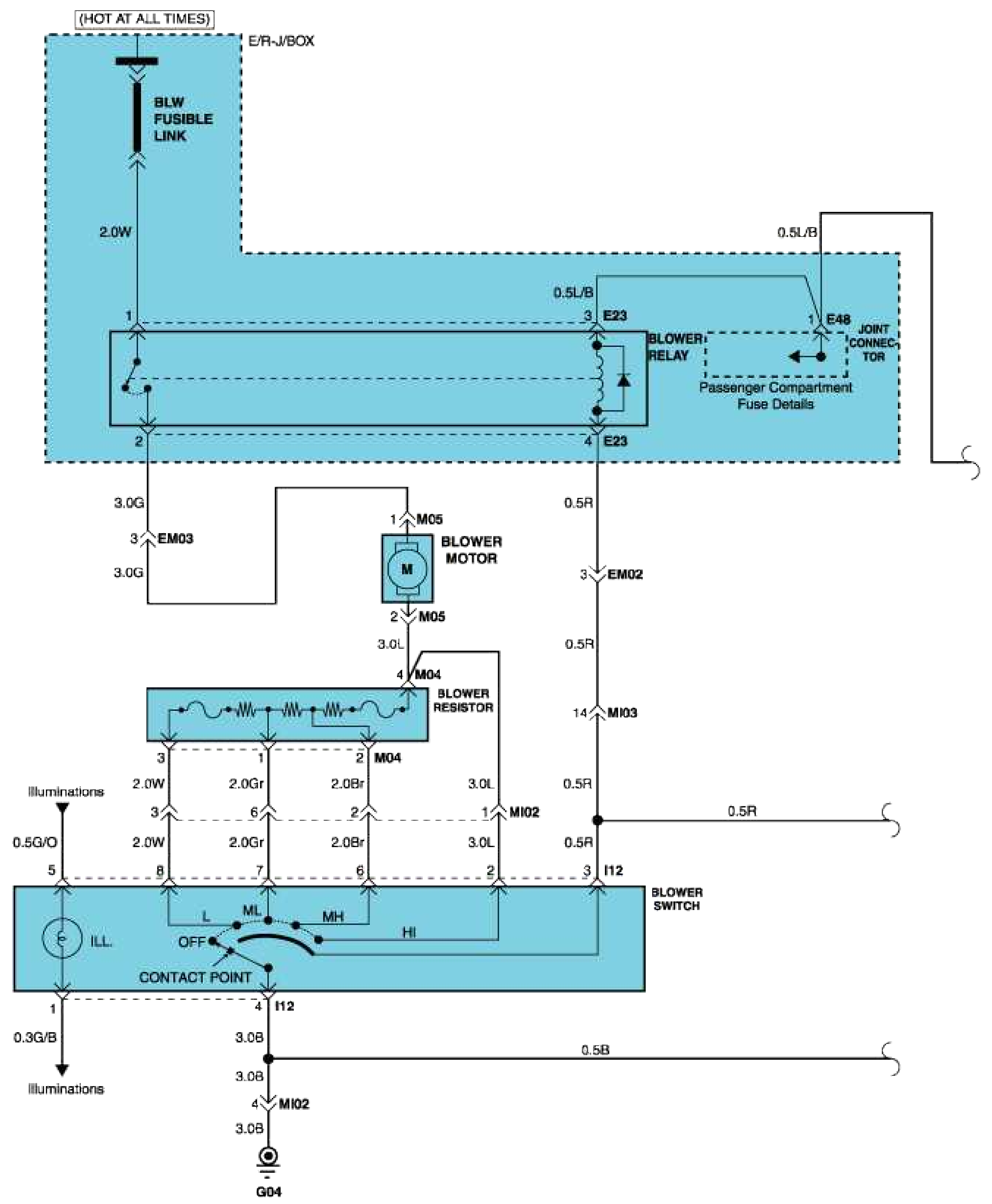
Heating,Ventilation, Air Condioning > Heater > The Other Heater Component > Components and Components Location

COMPONENTS

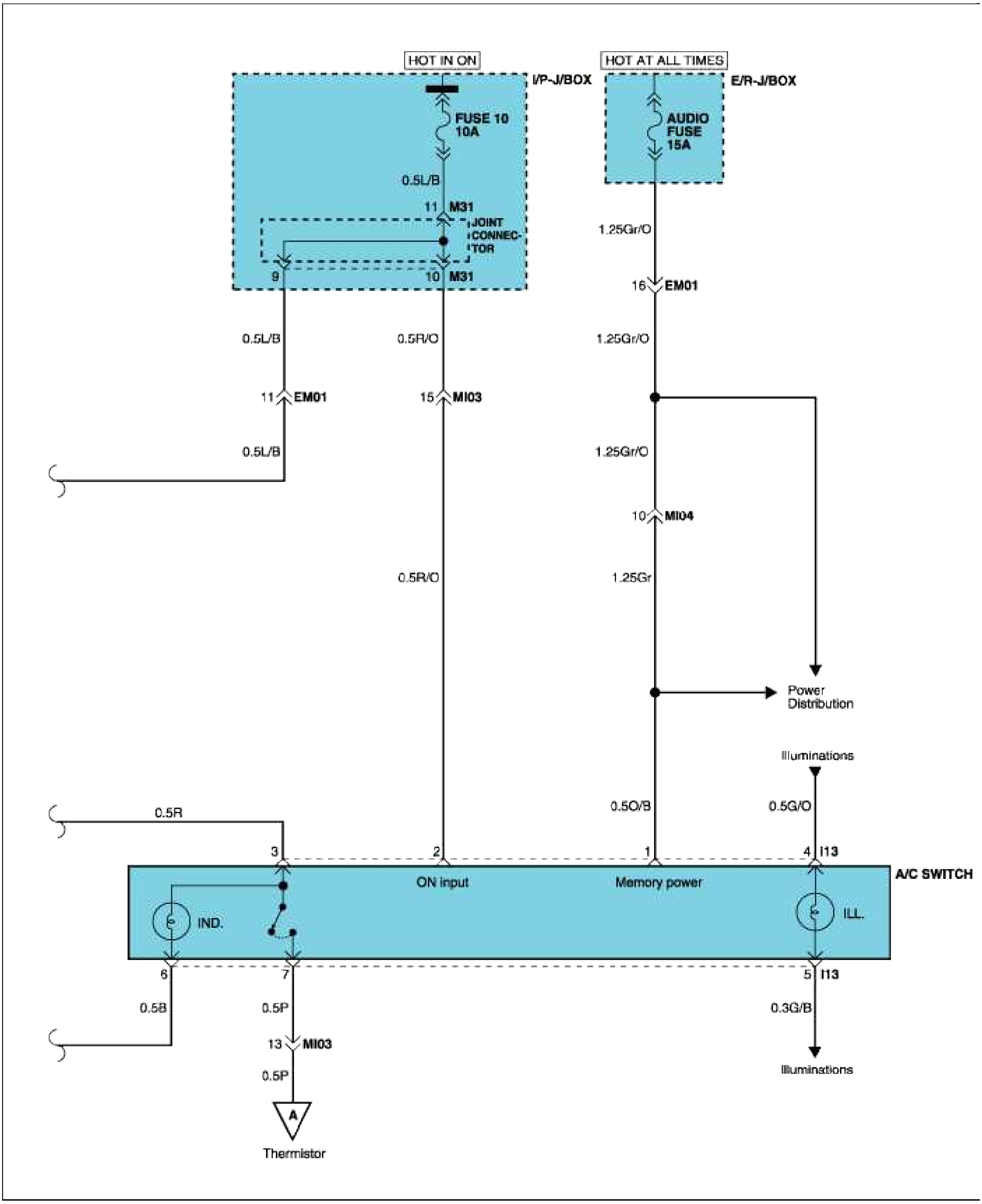

Rear heating duct (LH)
Rear duct (LR)
Heater assembly
Rear heating duct (RH)
Front seat crossmember
Rear duct (RR)

Heating,Ventilation, Air Condioning > Blower > Schematic Diagrams

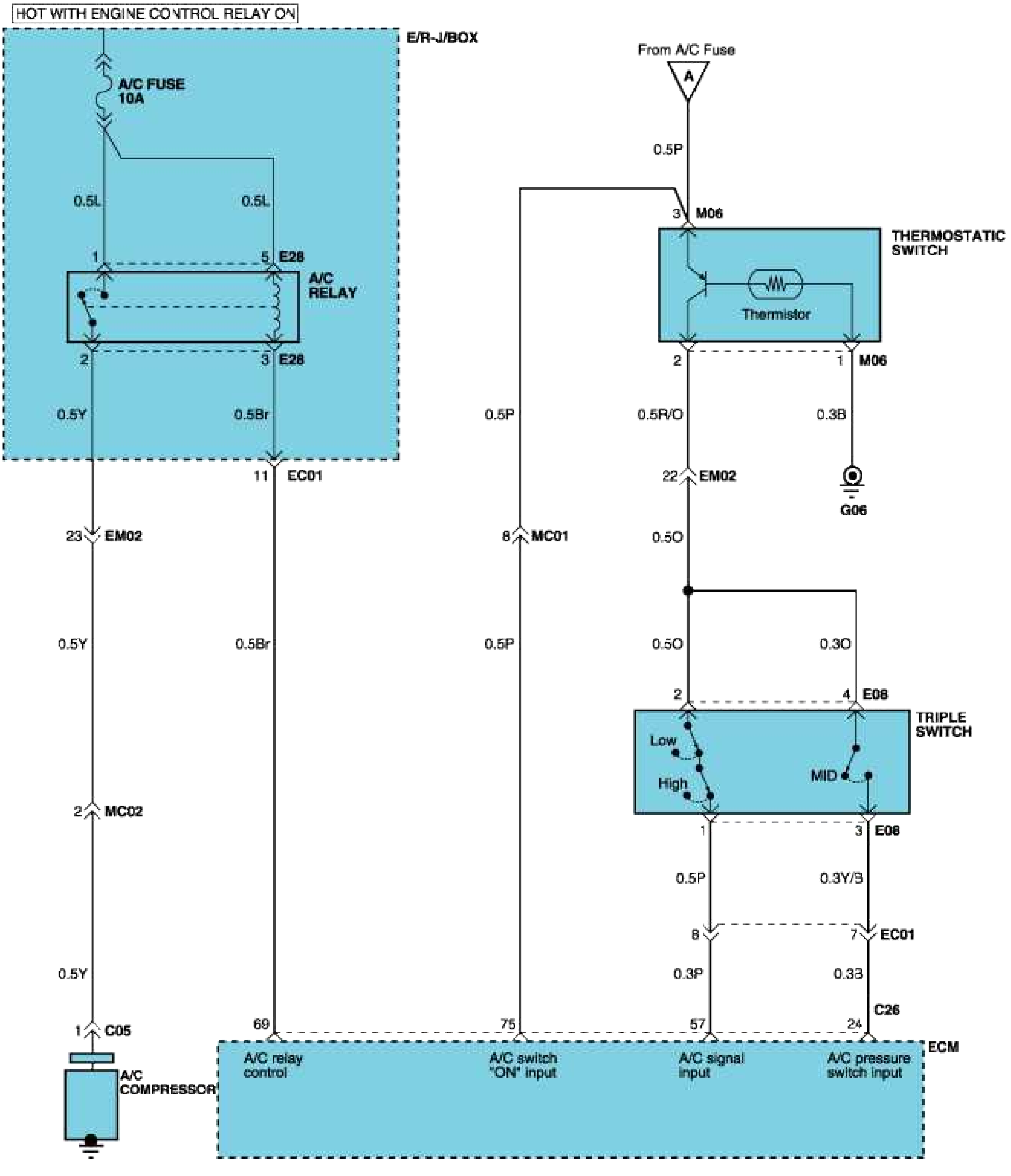
SCHEMATIC DIAGRAM (MANUAL) (1)


(HOT AT ALL TIMES)
E/R-J/BOX
BLW FUSIBLE LINK
2.0W
0.5L/B
0.5L/B
1
3
E23
1
E48
JOINT CONNECTOR
BLOWER RELAY
Passenger Compartment Fuse Details
2
4
E23
3.0G
3
EM03
3.0G
1
M05
BLOWER MOTOR
M
2
M05
3.0L
0.5R
3
EM02
0.5R
4
M04
BLOWER RESISTOR
14
MI03
3
1
2
M04
2.0W
2.0Gr
2.0Br
3.0L
0.5R
Illuminations
3
6
2
1
MI02
0.5R
0.5G/O
2.0W
2.0Gr
2.0Br
3.0L
0.5R
5
8
7
6
2
3
I12
BLOWER SWITCH
ILL.
L
ML
MH
HI
OFF
CONTACT POINT
1
4
I12
0.3G/B
3.0B
0.5B
Illuminations
3.0B
4
MI02
3.0B
G04

SCHEMATIC DIAGRAM (MANUAL) (2)

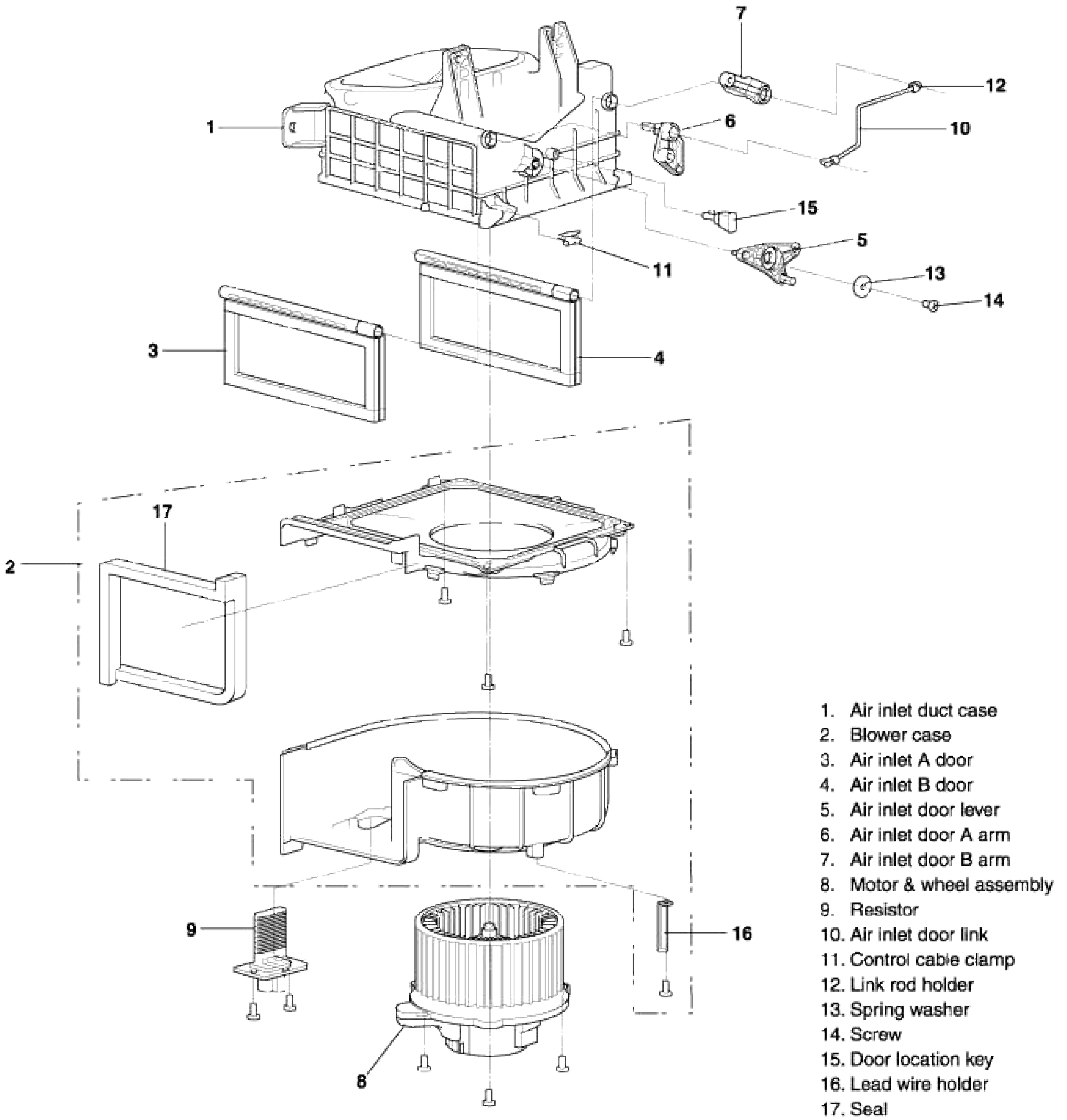

HOT IN ON
HOT AT ALL TIMES
I/P-J/BOX
E/R-J/BOX
FUSE 10
10A
AUDIO
FUSE
15A
0.5L/B
11 M31
JOINT
CONNEC-
TOR
9
10 M31
1.25Gr/O
16 EM01
0.5L/B
0.5R/O
1.25Gr/O
11 EM01
15 MI03
0.5L/B
1.25Gr/O
10 MI04
0.5R/O
1.25Gr
Power
Distribution
Illuminations
0.5R
0.5O/B
0.5G/O
3
2
1
4 I13
A/C SWITCH
ON input
Memory power
IND.
ILL.
6
7
5 I13
0.5B
0.5P
0.3G/B
13 MI03
0.5P
A
Thermistor
Illuminations

SCHEMATIC DIAGRAM (MANUAL) (3)


HOT WITH ENGINE CONTROL RELAY ON
E/R-J/BOX
A/C FUSE 10A
0.5L
0.5L
1
5 E28
A/C RELAY
2
3 E28
0.5Y
0.5Br
11 EC01
23 EM02
0.5Y
0.5Br
2 MC02
0.5Y
1 C05
A/C COMPRESSOR
From A/C Fuse
A
0.5P
3 M06
THERMOSTATIC SWITCH
Thermistor
2
1 M06
0.5P
0.5R/O
0.3B
22 EM02
G06
8 MC01
0.5O
0.5P
0.5O
0.3O
2
4 E08
TRIPLE SWITCH
Low
High
MID
1
3 E08
0.5P
0.3Y/B
8
7 EC01
0.3P
0.3B
C26
69
75
57
24
ECM
A/C relay control
A/C switch "ON" input
A/C signal input
A/C pressure switch input

Heating,Ventilation, Air Condioning > Blower > Blower Unit > Components and Components Location

COMPONENTS

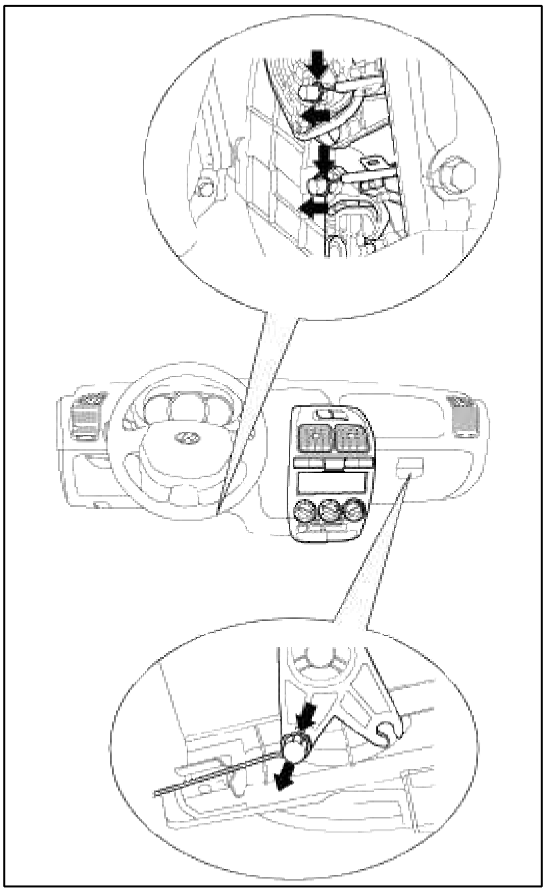


1. Air inlet duct case
2. Blower case
3. Air inlet A door
4. Air inlet B door
5. Air inlet door lever
6. Air inlet door A arm
7. Air inlet door B arm
8. Motor & wheel assembly
9. Resistor
10. Air inlet door link
11. Control cable clamp
12. Link rod holder
13. Spring washer
14. Screw
15. Door location key
16. Lead wire holder
17. Seal

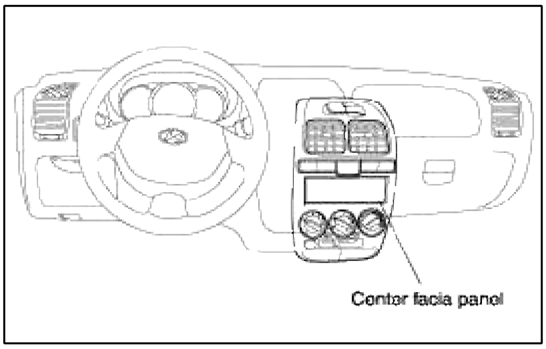
Heating,Ventilation, Air Condioning > Blower > Blower Unit > Repair procedures

REMOVAL

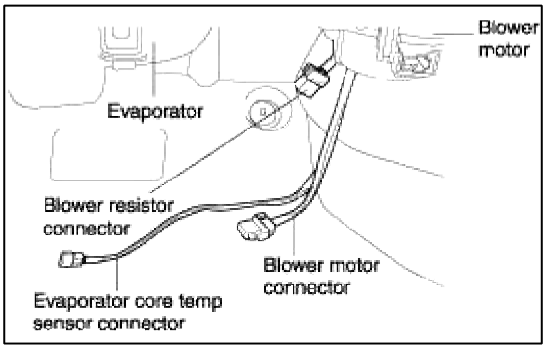
1. Remove the 2 heater side control cables and one blower side control cable.



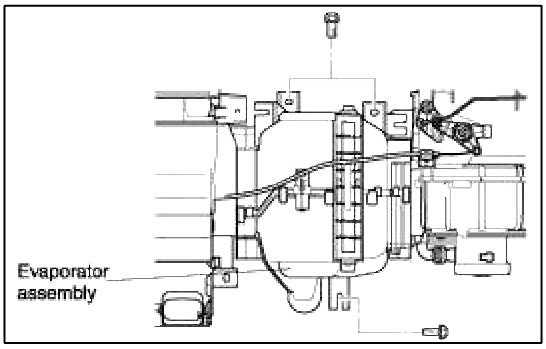
2. Remove the center facia panel from the lower portion.


Center facia panel

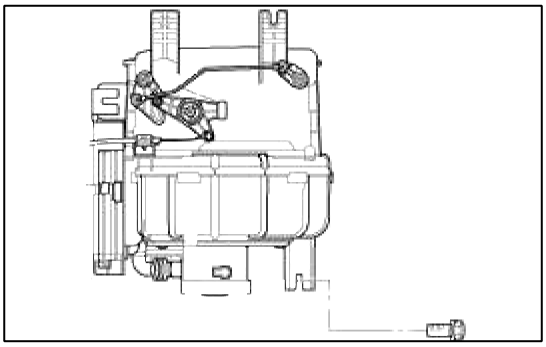
3. Disconnect the switch connectors and remove the center facia panel.
4. After removing the mounting bolts, remove the main crash pad. (Refer to "CRASH PAD" of BD guoup)
5. Disconnect the evaporator core temp sensor (thermister), blower resistor connector, and motor connector.


Blower motor
Evaporator
Blower resistor connector
Blower motor connector
Evaporator core temp sensor connector

6. Remove the evaporator unit.

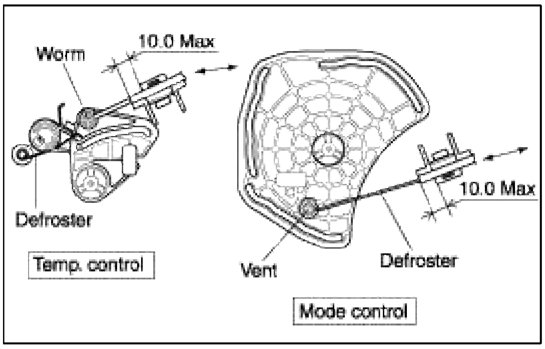

Evaporator assembly

7. Remove the blower unit.



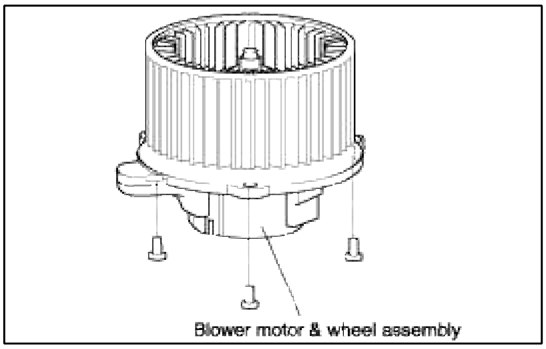
INSTALLATION

Installation is the reverse of removal. (Prior to installation of intake and exhaust cables, install the locating pin)

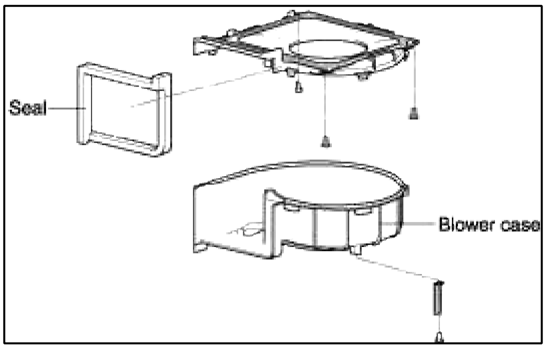

Worm
10.0 Max
Defroster
Temp. control
10.0 Max
Vent
Defroster
Mode control

DISASSEMBLY AND REASSEMBLY

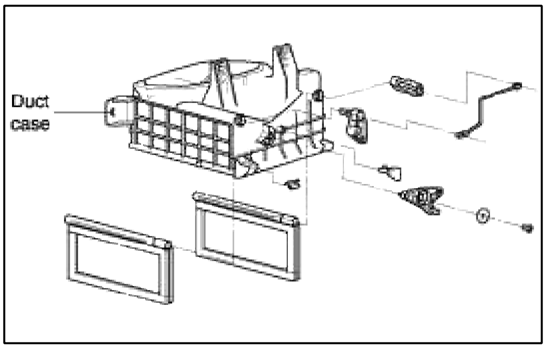
1. Loosen the motor mounting screw.


Blower motor & wheel assembly

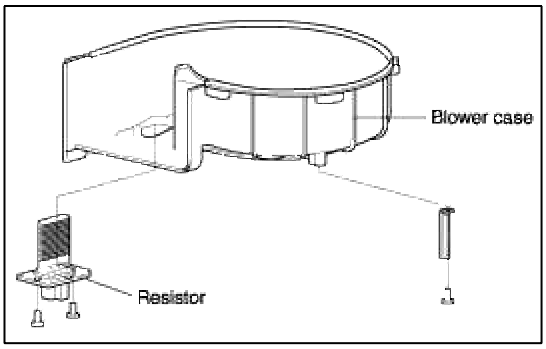
2. Loosen the duct and blower case mounting screw.



3. Disconnect the door lever and arm.



4. Remove the blower resistor.



5. Reassembly is the reverse of disassembly.

Heating,Ventilation, Air Condioning > Blower > Blower Motor > Repair procedures

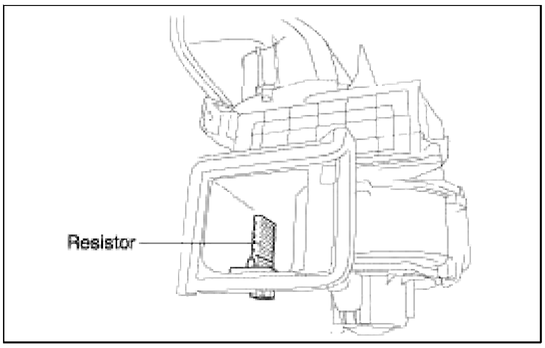
INSPECTION

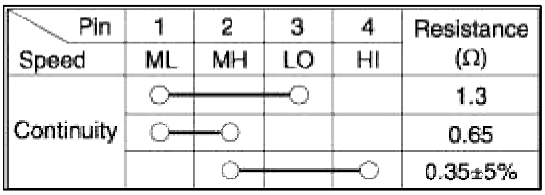
1. Check the blower motor shaft for bend.
2. Check the packing portion for crack.
3. Check the fan for damage.
4. Check the blower case for damage.
5. Check for the air selection damper operation.
6. Connect the blower motor to the battery and check for smooth operation.
7. Connect the blower motor to the opposite poles of battery and check for reverse operation.

Heating,Ventilation, Air Condioning > Blower > Blower Resistor > Repair procedures

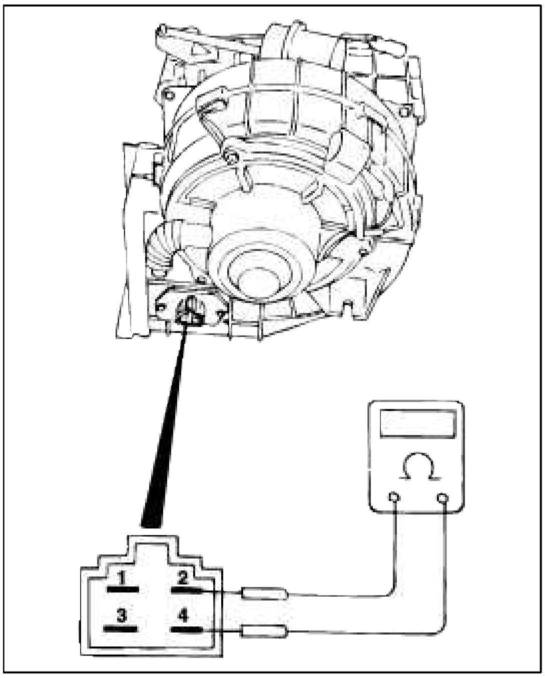
INSPECTION

Measure the resistance between terminals and replace the blower resistor if the measured value is not within the specified range.



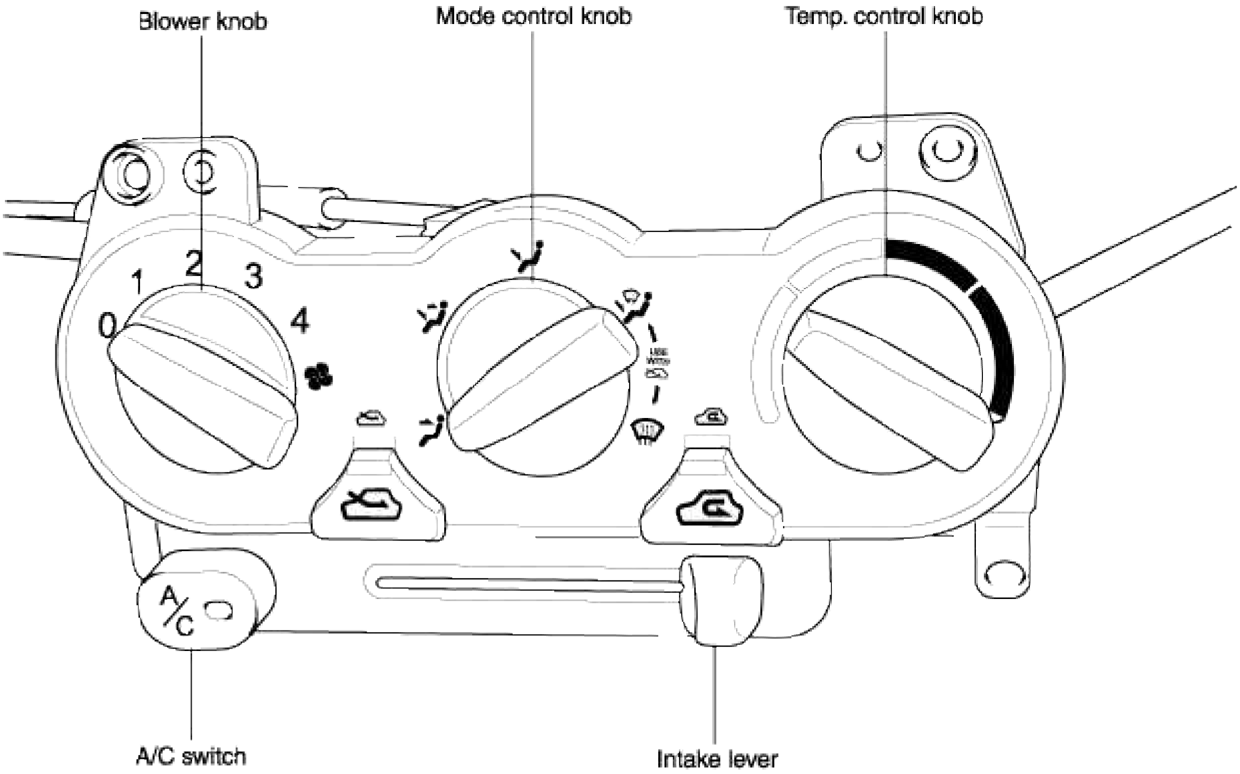


Speed \ Pin	1 ML	2 MH	3 LO	4 HI	Resistance (Ω)
Continuity	○	—	○		1.3
	○	○			0.65
		○	—	○	0.35±5%

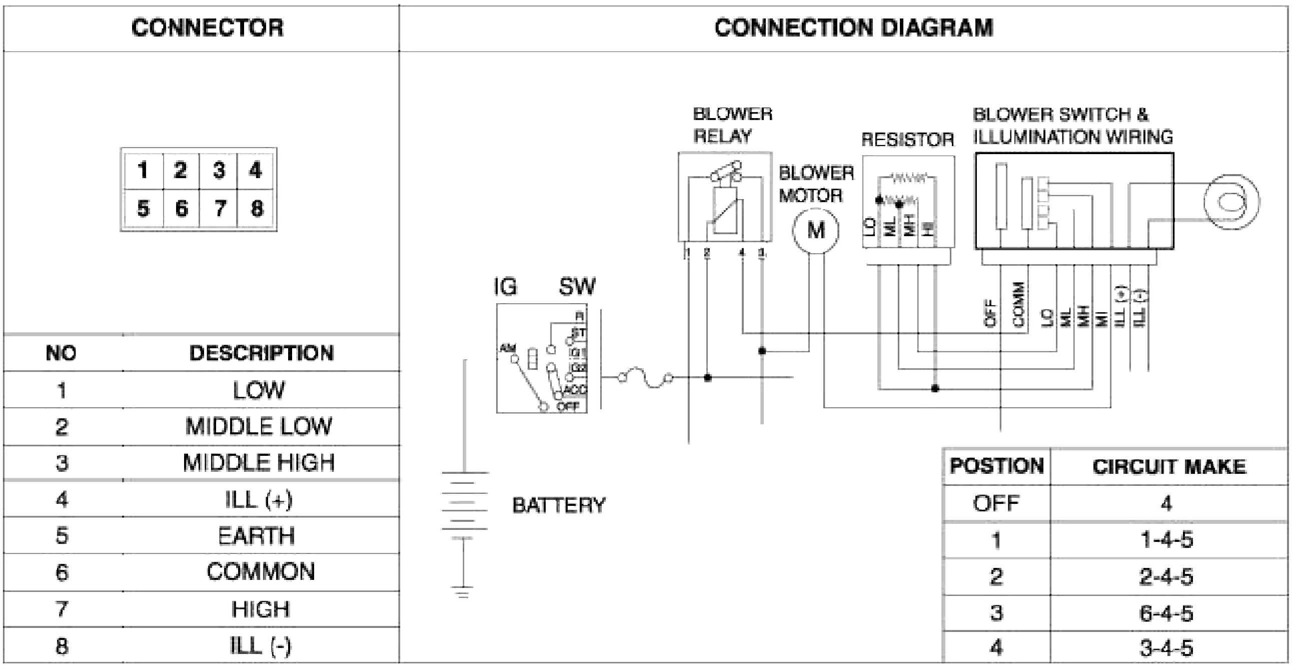


Heating,Ventilation, Air Condioning > Blower > Control Panel > Components and Components Location

COMPONENTS


Blower knob
Mode control knob
Temp. control knob
0
1
2
3
4
A/C
A/C switch
Intake lever

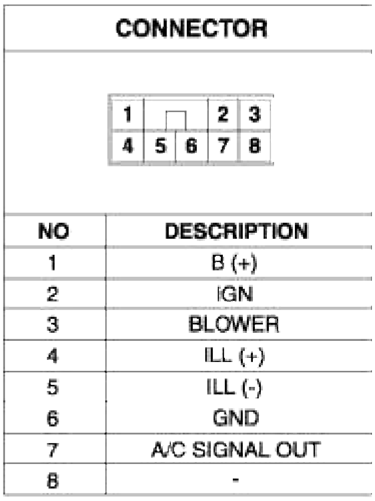
BLOWER SWITCH CONNECTOR & CONNECTION DIAGRAM


CONNECTOR
CONNECTION DIAGRAM
1 2 3 4
5 6 7 8
BLOWER RELAY
BLOWER MOTOR
M
RESISTOR
LO ML MH HI
BLOWER SWITCH & ILLUMINATION WIRING
OFF COMM LO ML MH MI ILL (+) ILL (-)
IG SW
BATTERY

NO	DESCRIPTION
1	LOW
2	MIDDLE LOW
3	MIDDLE HIGH
4	ILL (+)
5	EARTH
6	COMMON
7	HIGH
8	ILL (-)

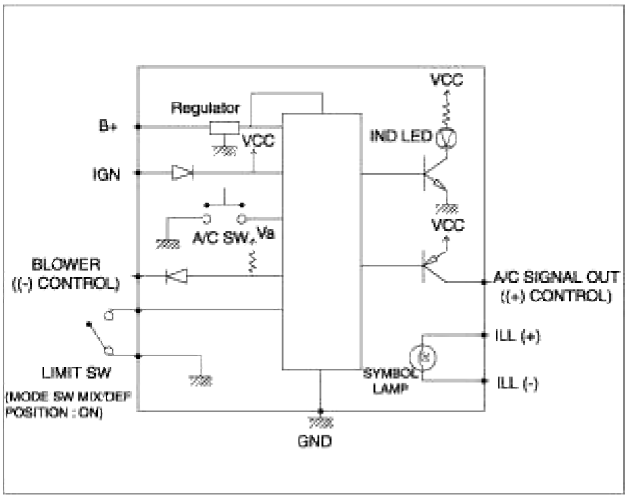
POSTION	CIRCUIT MAKE
OFF	4
1	1-4-5
2	2-4-5
3	6-4-5
4	3-4-5

A/C SWITCH & DEFROSTER SWITCH CONNECTOR


CONNECTOR
1 2 3
4 5 6 7 8

NO	DESCRIPTION
1	B (+)
2	IGN
3	BLOWER
4	ILL (+)
5	ILL (-)
6	GND
7	A/C SIGNAL OUT
8	-

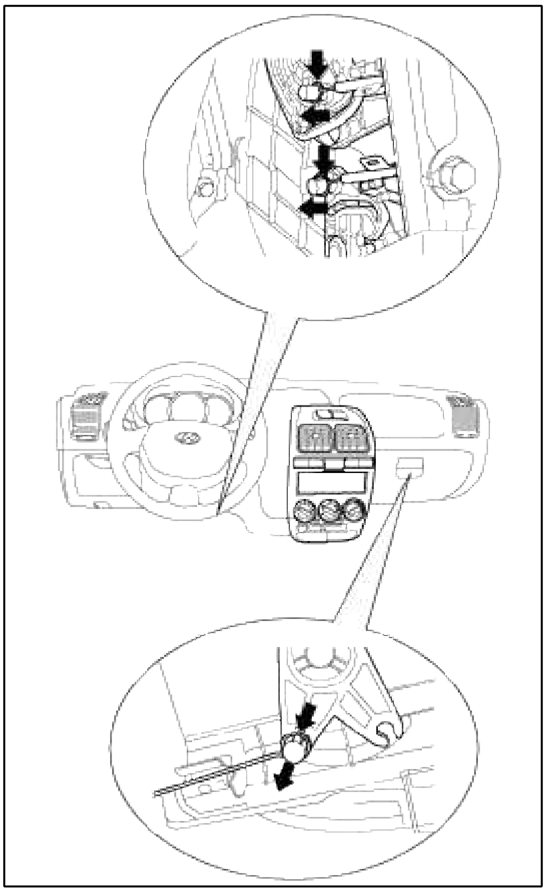
A/C SWITCH DIAGRAM


B+
Regulator
VCC
IGN
A/C SW
Va
BLOWER ((-) CONTROL)
LIMIT SW
(MODE SW MIX/DEF POSITION : ON)
VCC
IND LED
VCC
A/C SIGNAL OUT ((+) CONTROL)
ILL (+)
ILL (-)
SYMBOL LAMP
GND

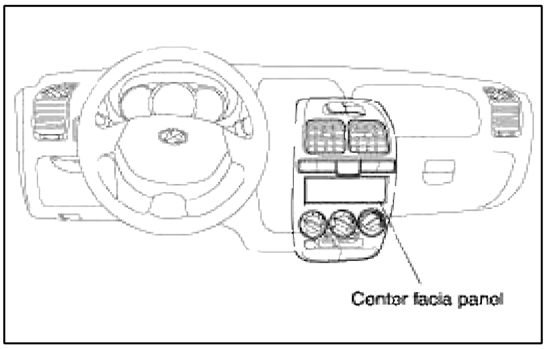
Heating,Ventilation, Air Condioning > Blower > Control Panel > Repair procedures

REMOVAL AND INSTALLATION

1. Remove the 2 control cables in the heater side and one control cable in the blower side.



2. Remove the center facia panel from the lower portion.



3. Disconnect the switch connectors and remove the center facia panel.
4. Installation is the reverse of removal.

DISASSEMBLY AND REASSEMBLY

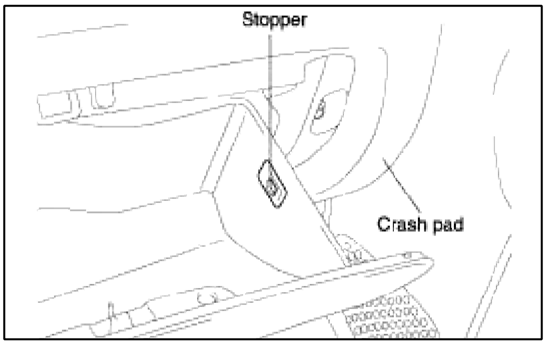
Refer to "COMPONENTS".

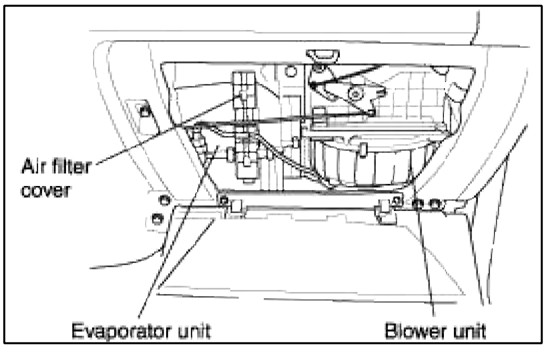
Heating,Ventilation, Air Condioning > Blower > Air cleaner filter > Repair procedures

AIR CONDITIONER AIR FILTER

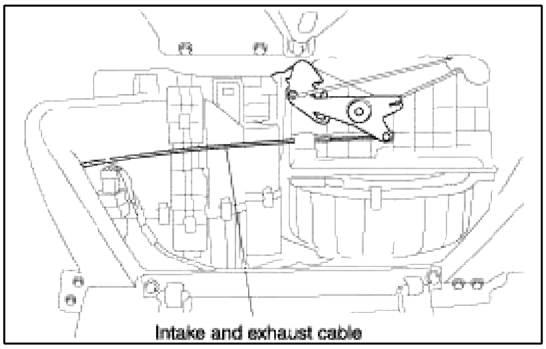
REPLACEMENT

1. Open the glove box, remove the glove box stopper in the lower crash pad (assist seat side), and completely lower the glove box.

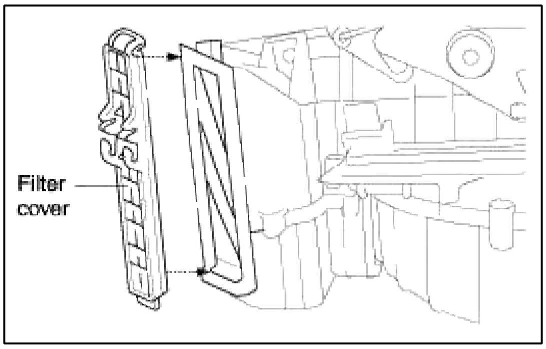

Stopper
Crash pad


Air filter cover
Evaporator unit
Blower unit

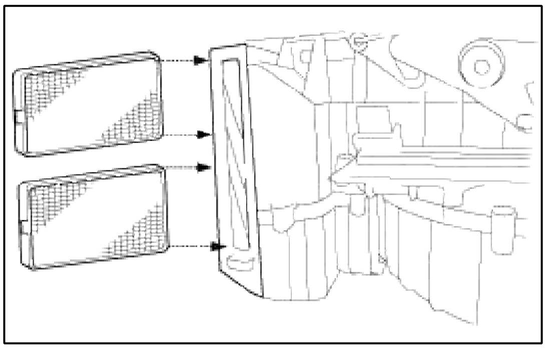
2. Disconnect the intake and exhaust cable from the blower unit.


Intake and exhaust cable

3. Press the hook on the air conditioner side air filter cover and remove the cover.

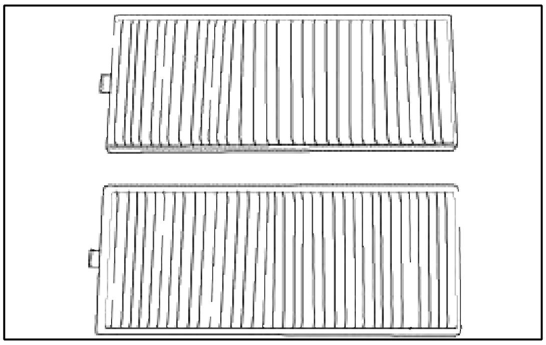

Filter cover

4. Replace the upper/lower air filters.



NOTE

When removing and installing, don't forget there are 2 air filters in the air conditioner.



ACCENT(LC) > 2002 > G 1.5 SOHC > Manual Transaxle System

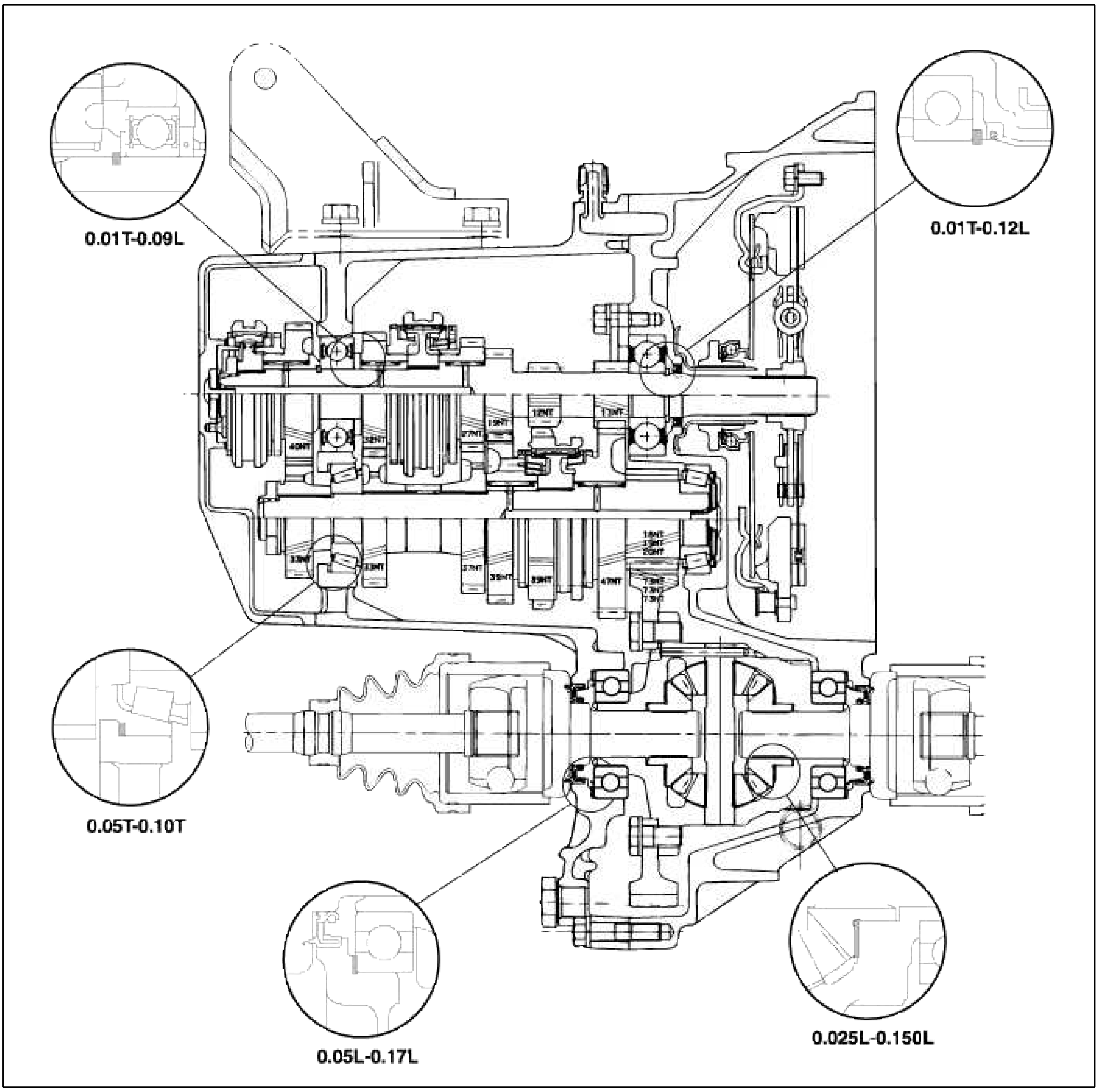
Manual Transaxle System > Manual Transaxle System > Components and Components Location

GENERAL INFORMATION (M5AF3)

Manual transaxle overhaul section has been separated from the shop manual.

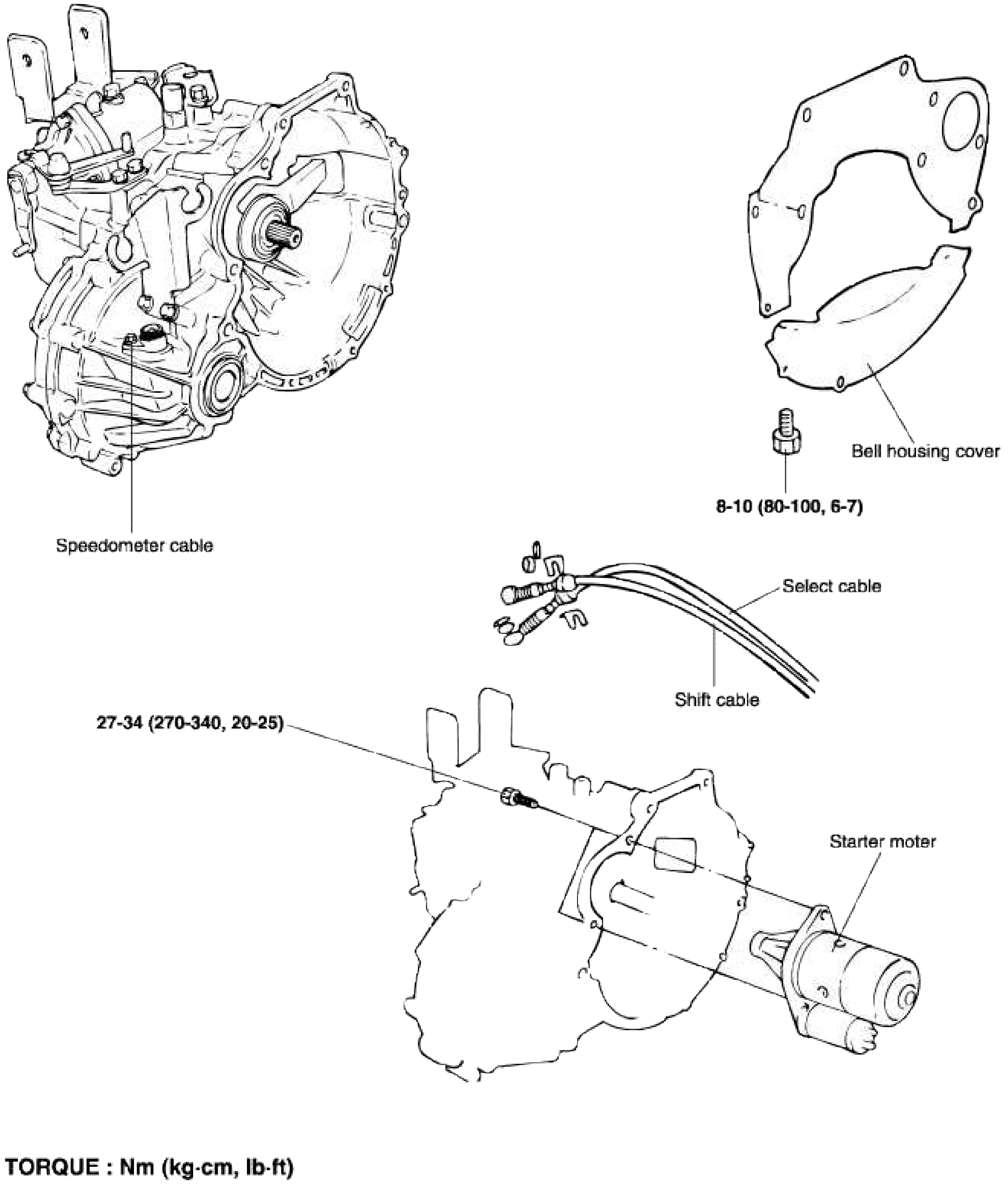
M5AF3 overhaul section was included in the overhaul manual.

SECTION VIEW

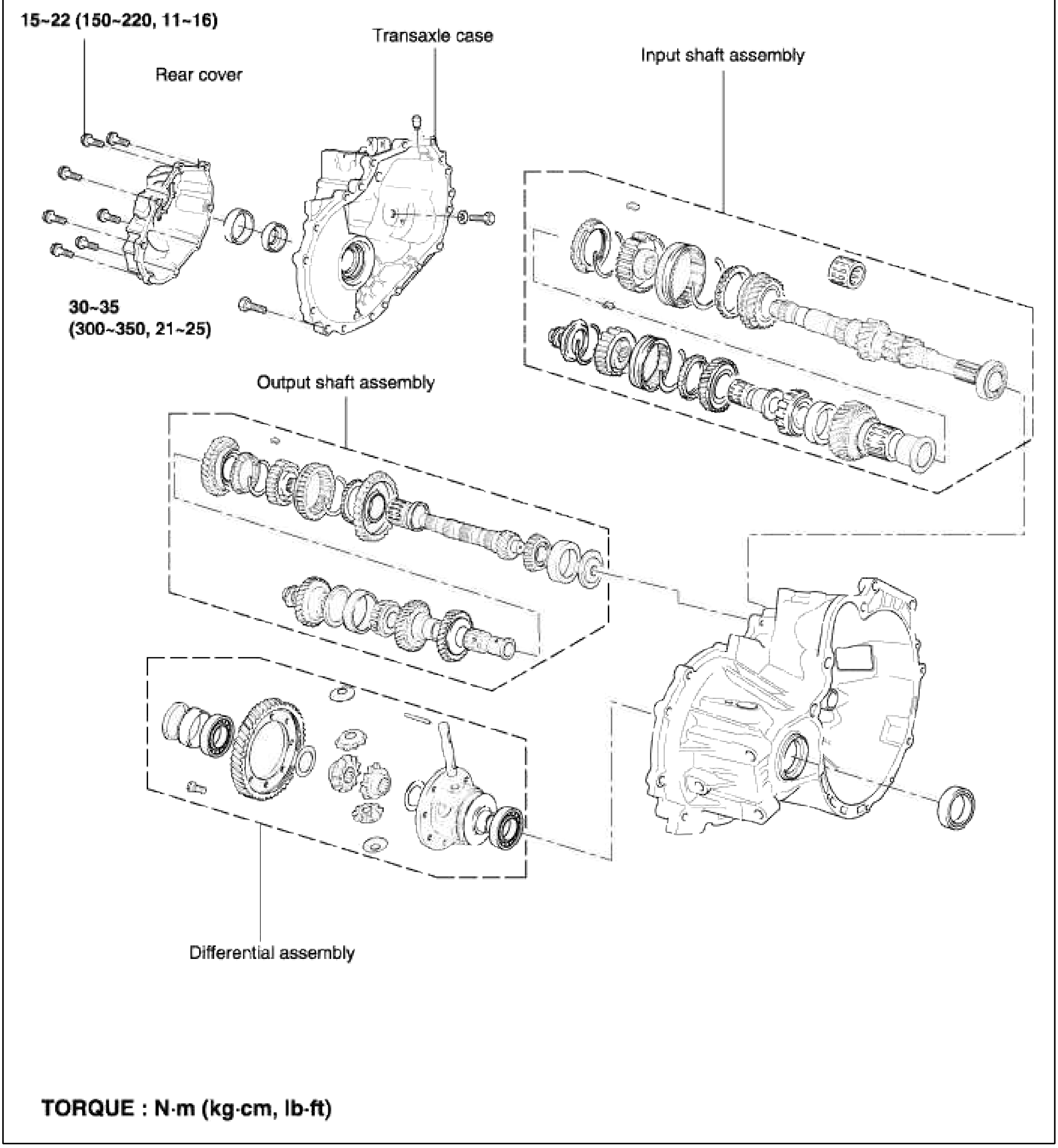

0.01T-0.09L
0.01T-0.12L
0.05T-0.10T
0.05L-0.17L
0.025L-0.150L

Manual Transaxle System > Manual Transaxle System > Manual Transaxle > Components and Components Location

COMPONENTS (1)


Bell housing cover
8-10 (80-100, 6-7)
Speedometer cable
Select cable
Shift cable
27-34 (270-340, 20-25)
Starter moter
TORQUE : Nm (kg-cm, lb-ft)

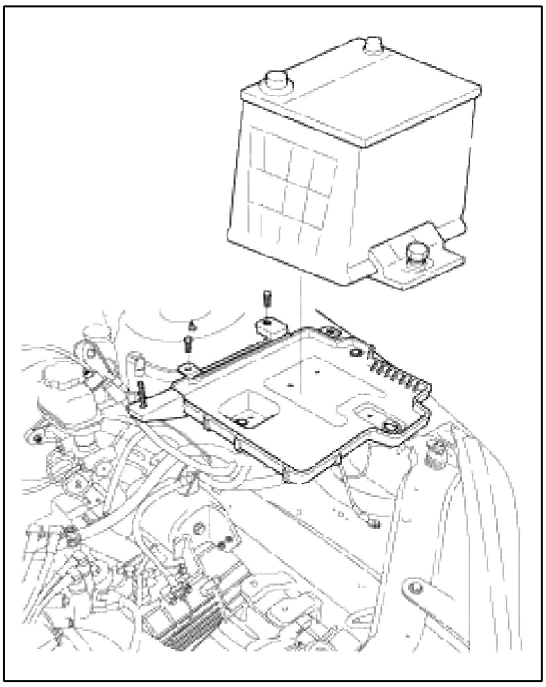
COMPONENTS (2)


15~22 (150~220, 11~16)
Transaxle case
Rear cover
Input shaft assembly
30~35
(300~350, 21~25)
Output shaft assembly
Differential assembly
TORQUE : N·m (kg·cm, lb·ft)

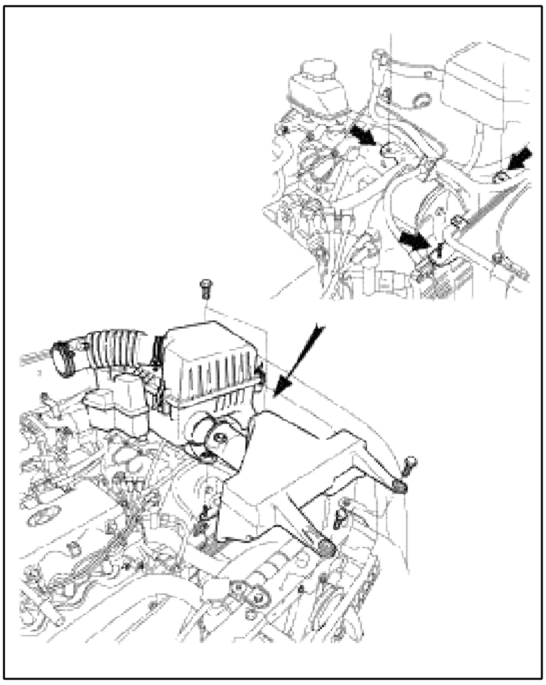
Manual Transaxle System > Manual Transaxle System > Manual Transaxle > Repair procedures

REMOVAL

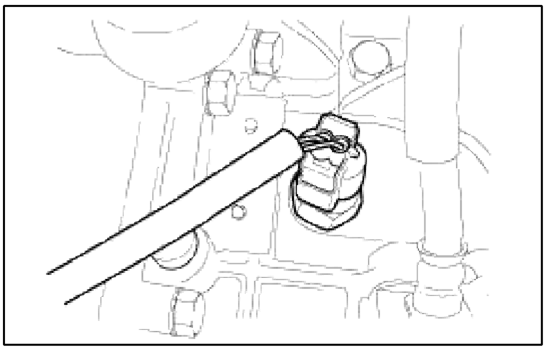
1. Remove the battery terminal and the battery.



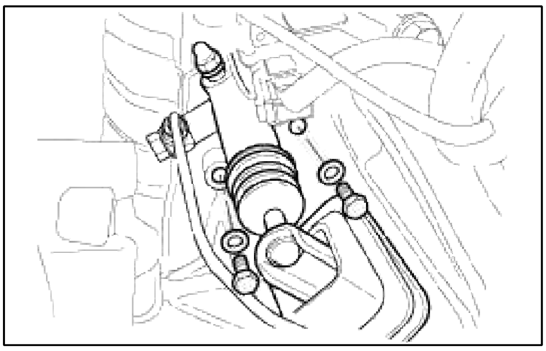
2. Removal the air cleaner.



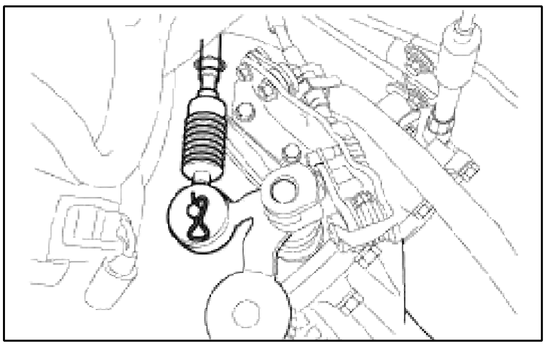
3. Remove the back-up lamp switch.



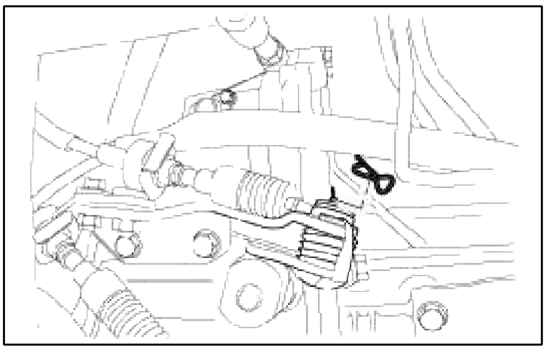
4. Remove the clutch release mounting bolts.



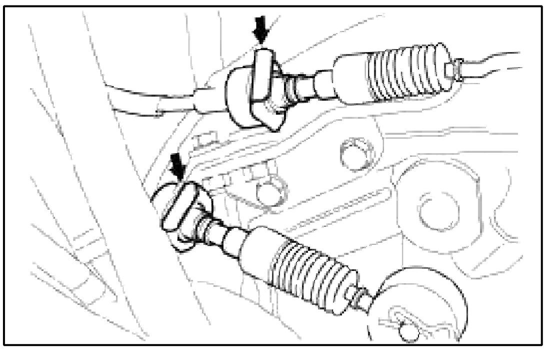
5. Remove the cotter pin of the shift cable.



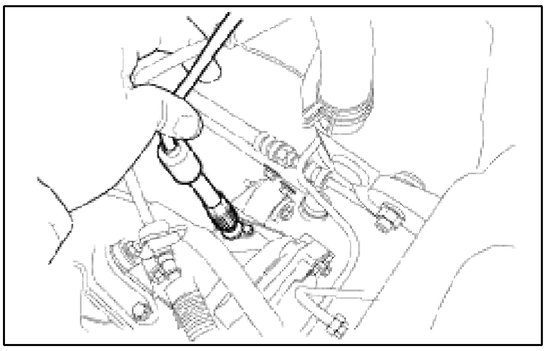
6. Remove the cotter pin of the selector cable.



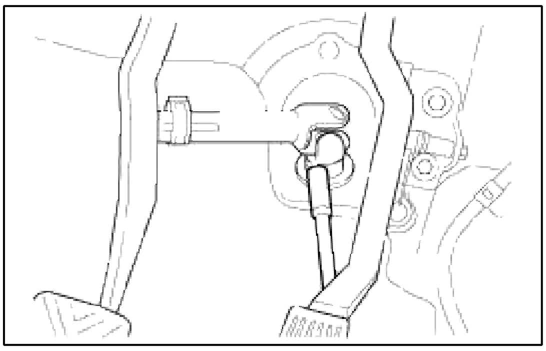
7. Remove the clip of the shift cable.
8. Remove the clip of the selector cable.



9. Remove the speedometer driven gear connector.

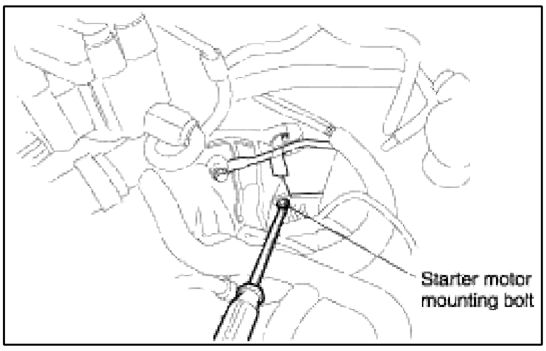


10. Remove the u-joint.

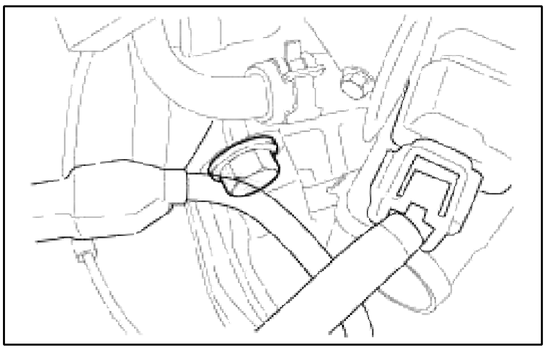


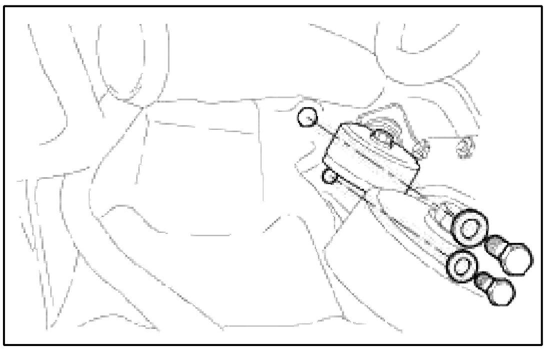
11. Remove the power steering return hose.
12. Remove the tire.

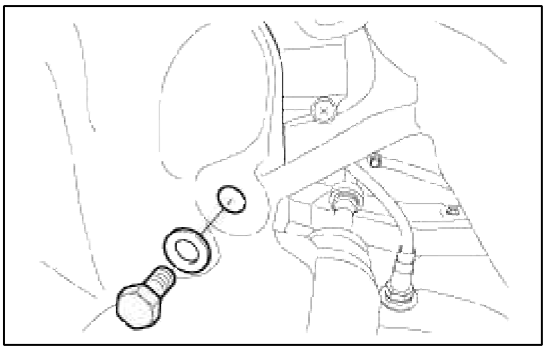
13. Remove the starter motor upward the transaxle.


Starter motor mounting bolt

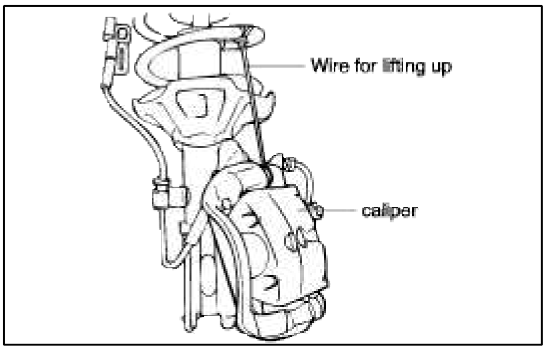
14. Remove the bolt for the upper connection of the engine and the transaxle.



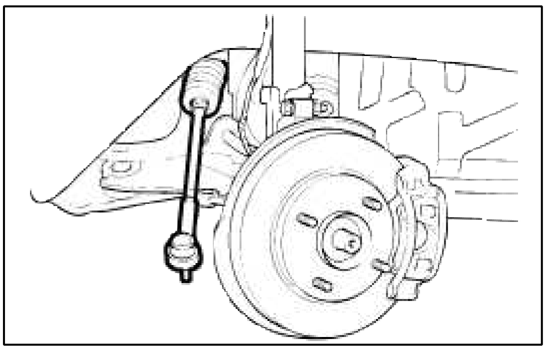




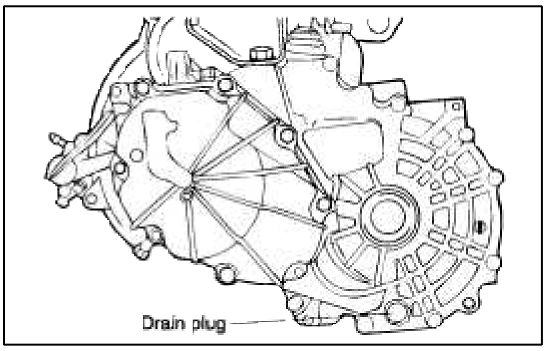
15. Remove the caliper after lifting up the vehicle.


Wire for lifting up
caliper

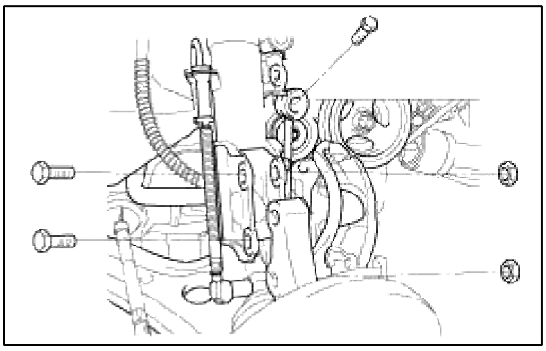
16. Separate the tie rod end from the pin and nut.



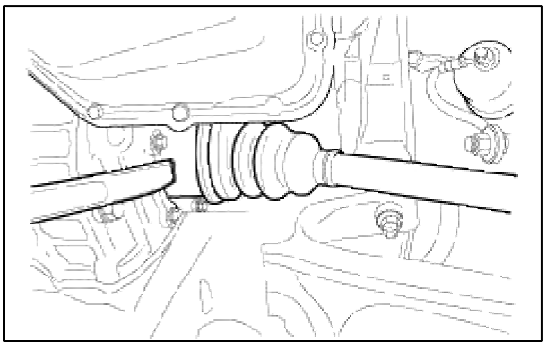
17. Remove the oil drain plug and drain the oil.



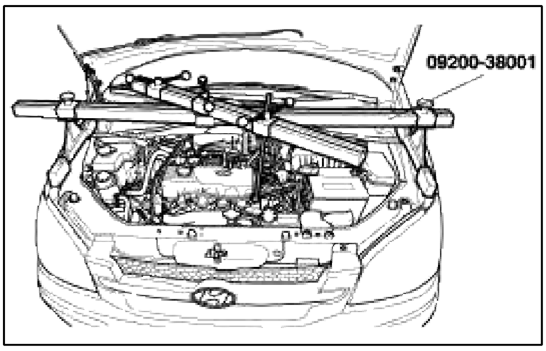
18. Remove the wheel speed sensor and the knuckle mounting bolt.



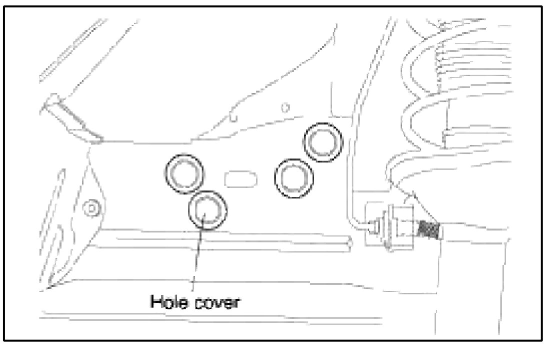
19. Remove the drive shaft and the hub nut.



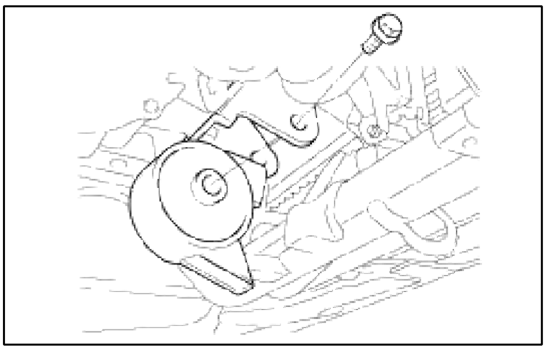
20. Install the special tool, the engine support fixture on the engine assembly.



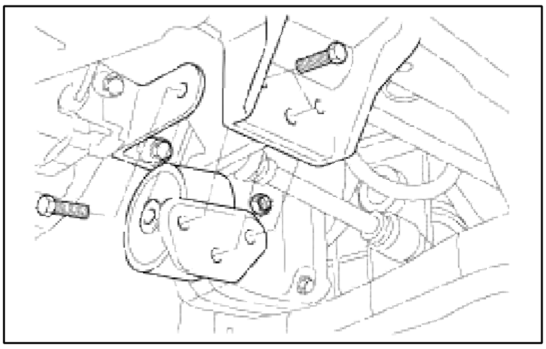
21. Remove the transaxle mounting bracket after removing the hole cover and the mounting bolts.



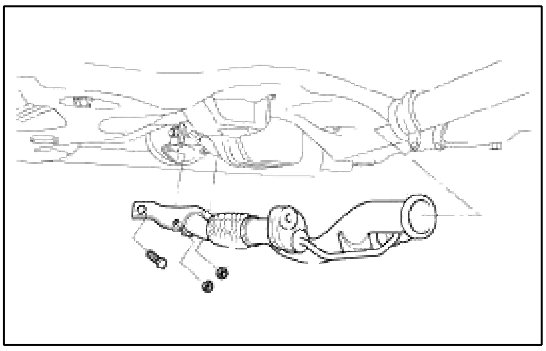
22. Remove the front roll stopper.



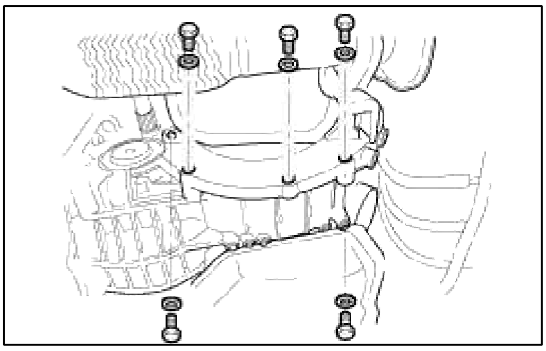
23. Remove the rear roll stopper.



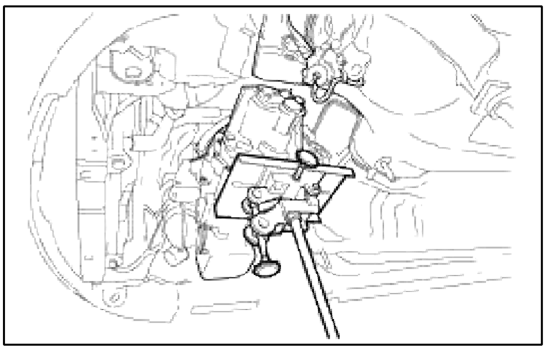
24. Remove the front muffler.



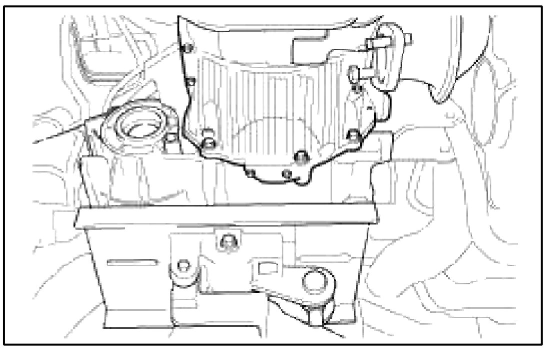
25. Remove the bell housing cover. (Bolt : 5EA)



26. Install the jack for supporting transaxle.



27. Remove the sub frame.
28. Remove the lower mounting bolts of the transaxle.



29. Remove the transaxle.

INSTALLATION

Installation is the reverse of removal.

INSPECTION

TRANSAXLE GEAR OIL LEVEL INSPECTION

Inspect the transaxle for evidence of leakage. Check the gear oil level by removing the filler plug. If the oil is contaminated, it is necessary to replace it with new oil.

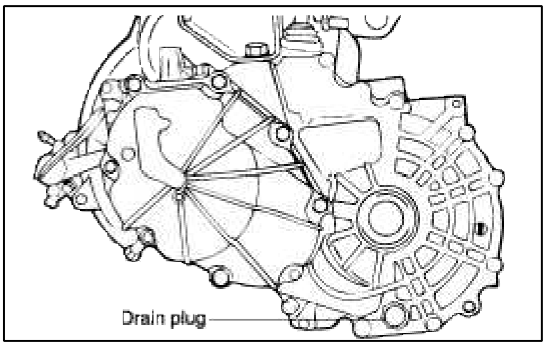
1. Remove the oil filler plug and check the level with finger.
2. Oil level must be up to the filler hole. If it is below the hole, add oil until it runs out, then reinstall the plug.
3. Replace the oil if the transaxle gear oil is noticeably dirty, or it is not of a suitable viscosity.

REPLACEMENT OF TRANSAXLE GEAR OIL

Use HP Gear Oil SAE 75W/90 (API-GL-4)

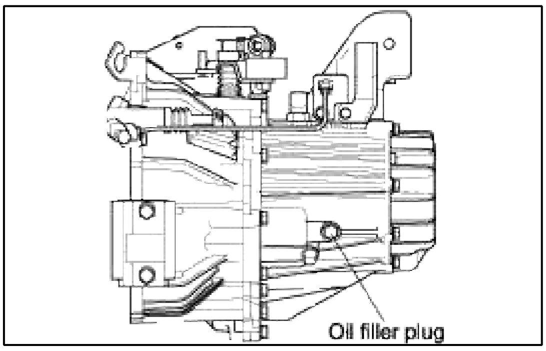
1. With the vehicle parked on a level surface, remove the drain plug and drain the transaxle oil.
2. Replace the gasket with a new one and install the drain plug.

Tightening torque:
Drain plug:30~35 Nm (300~350 kg·cm, 22~25 lb·ft)



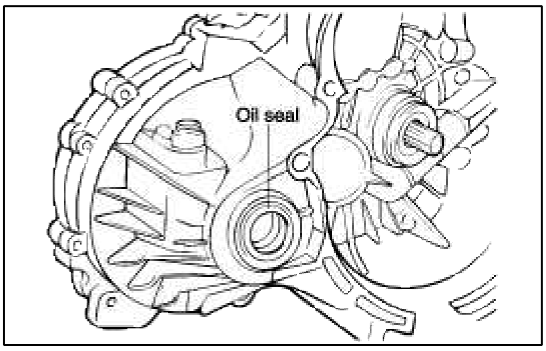
3. Add new oil the through the filler plug, filling to the same level as the opening plug.

Transaxle oil total capacity:
2.15 Liters (2.27 U.s.qts., 1.89 lmp.qts.)
Tightening torque :
Filler plug:30~35 Nm (300~350 kg·cm, 22~25 lb·ft)



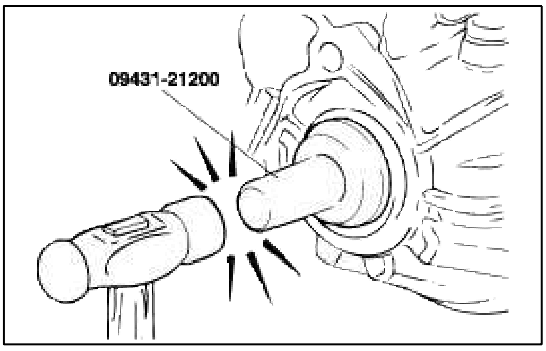
DRIVE SHAFT OIL SEAL REPLACEMENT

1. Disconnect the drive shaft from the transaxle (Refer to DS GROUP).
2. Using a flat-tip screwdriver, remove the oil seal.



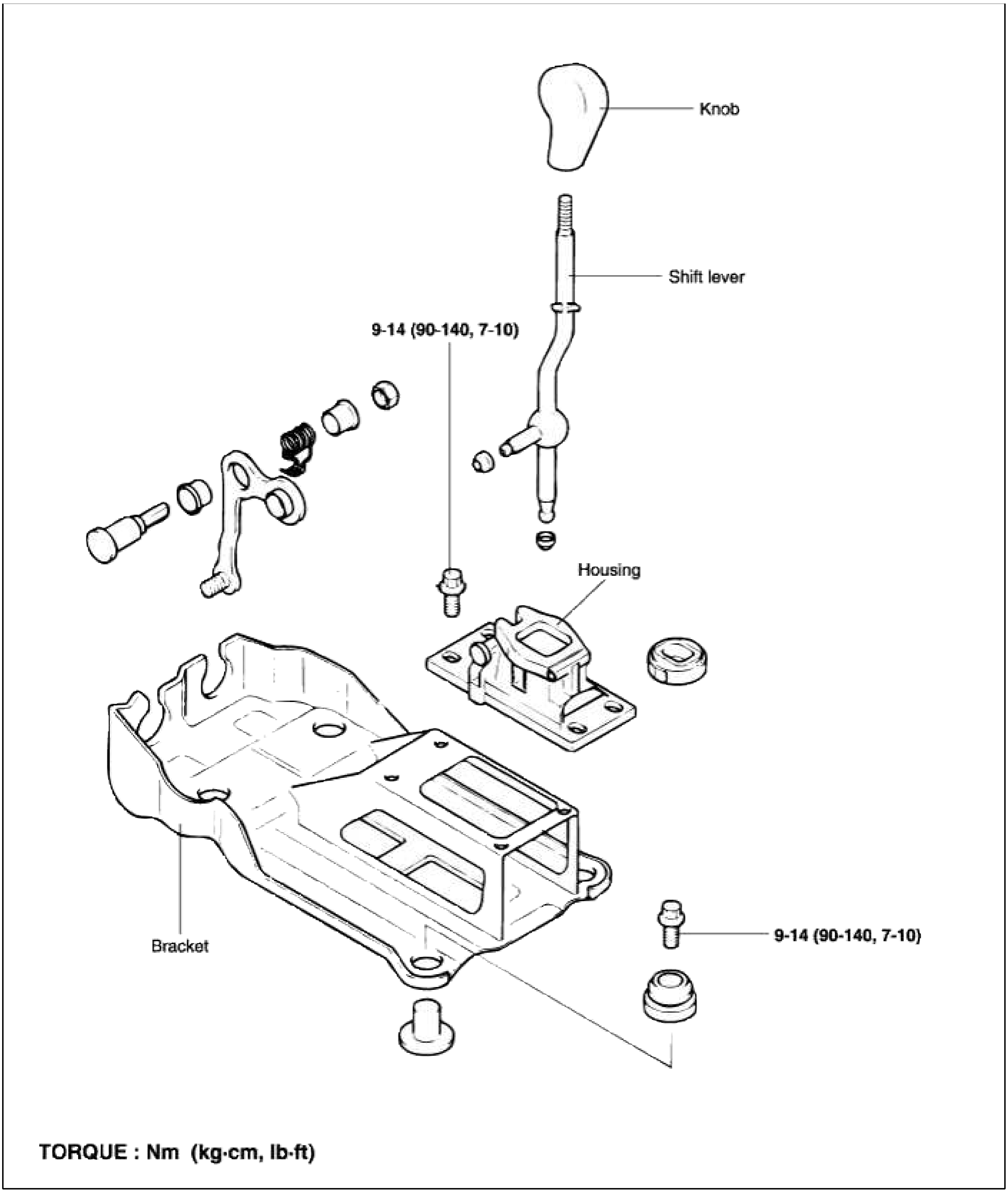
3. Using the special tool (09431-21200), tap the drive shaft oil seal into the transaxle.
4. Apply a coating of gear oil to the lip of the oil seal.

Transaxle gear oil:
HYUNDAI GENUINE PARTS MTF 75W/90
conforming to API GL-4 or higher



Manual Transaxle System > Manual Transaxle System > Shift Lever > Components and Components Location

COMPONENTS


Knob
Shift lever
9-14 (90-140, 7-10)
Housing
Bracket
9-14 (90-140, 7-10)
TORQUE : Nm (kg·cm, lb·ft)

Manual Transaxle System > Manual Transaxle System > Shift Lever > Repair procedures

INSPECTION

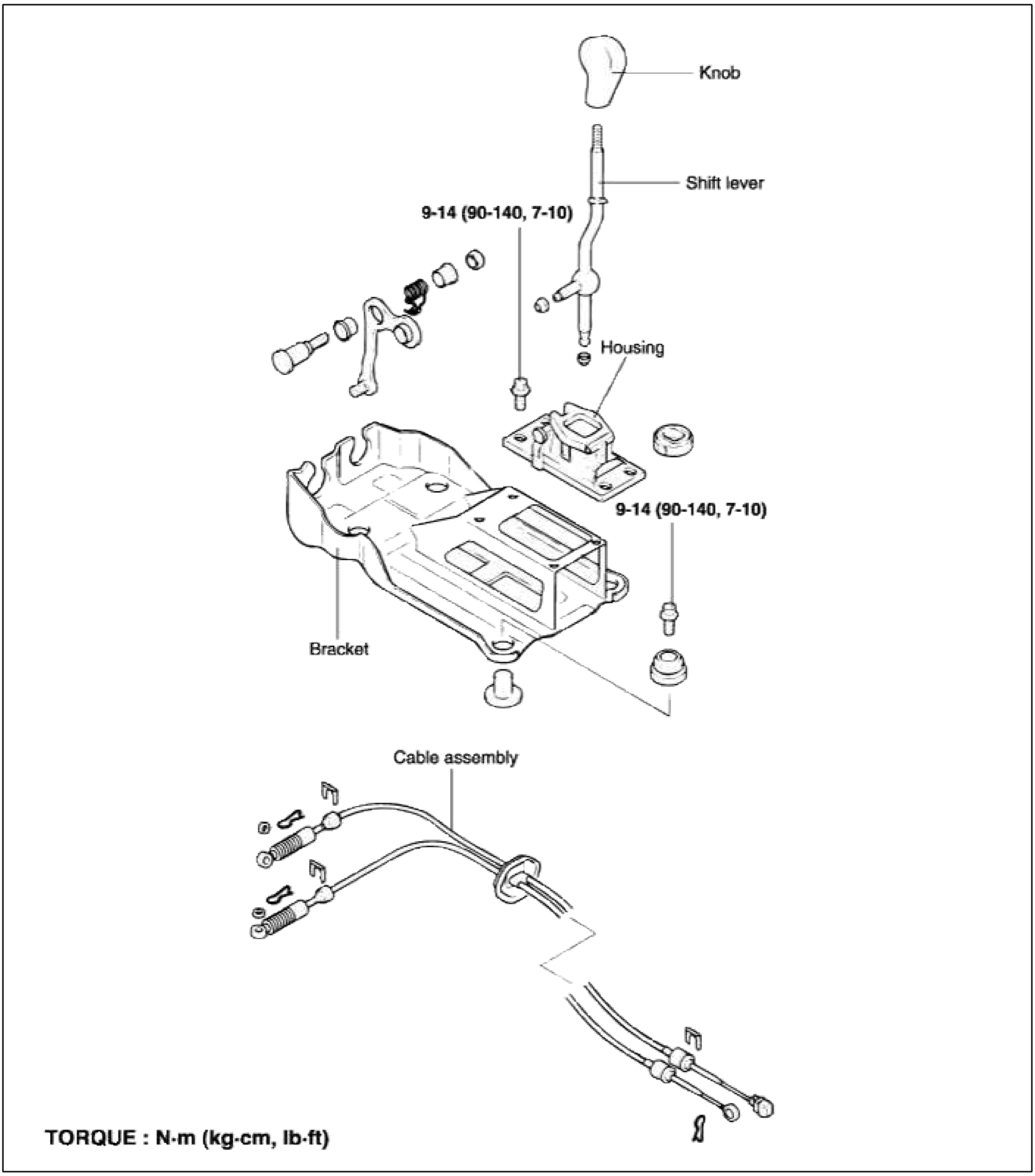
1. Check the bushing for wear or damage.
2. Check the return spring for damage or deterioration.

REASSEMBLY

1. Apply multi-purpose grease to the sliding part of the bushings.
2. Reassembly is the reverse of disassembly.

Manual Transaxle System > Manual Transaxle Control System > Manual Transaxle Shift Control > Components and Components Location

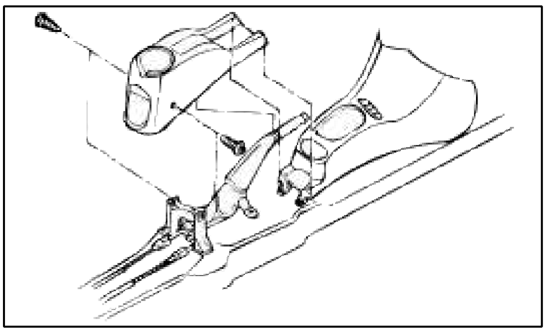
COMPONENTS


Knob
Shift lever
9-14 (90-140, 7-10)
Housing
9-14 (90-140, 7-10)
Bracket
Cable assembly
TORQUE : N·m (kg-cm, lb-ft)

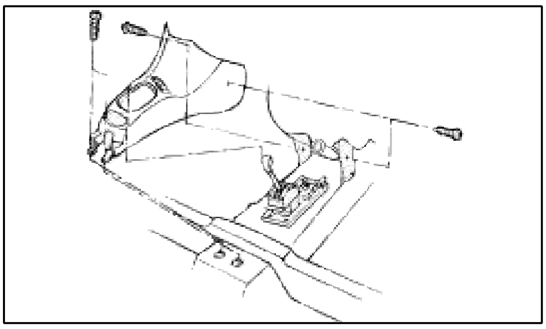
Manual Transaxle System > Manual Transaxle Control System > Manual Transaxle Shift Control > Repair procedures

REMOVAL

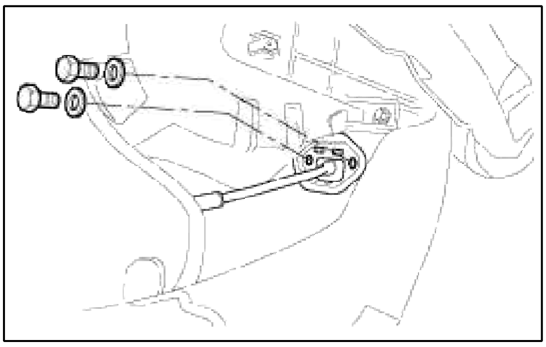
1. Remove the shift knob and the rear console.



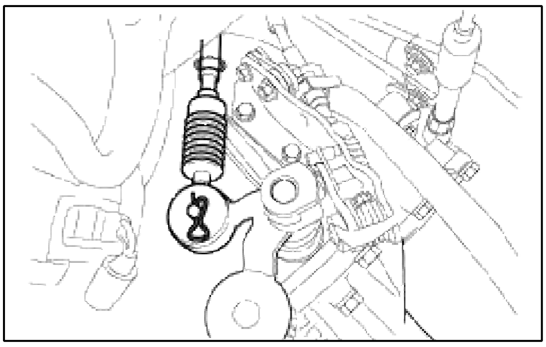
2. Remove the front console.



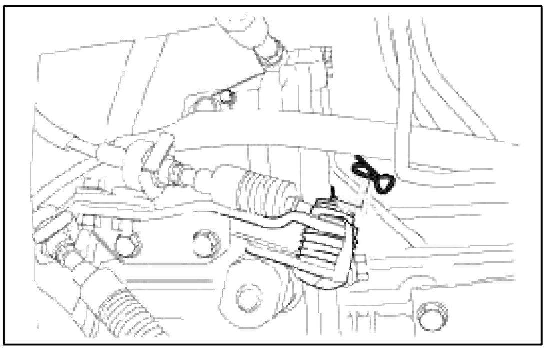
3. Remove the cable mounting bolts of the lower dash board.



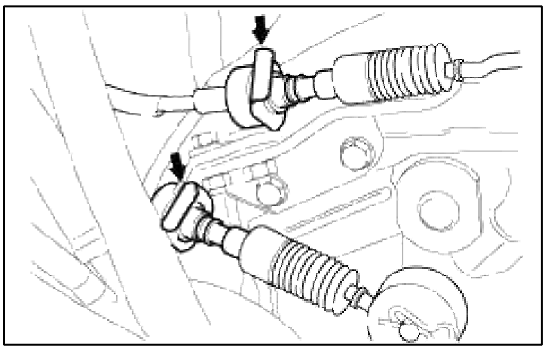
4. Remove the cotter pin of the shift cable.



5. Remove the cotter pin of the selector cable.



6. Remove the clip of the shift cable and the selector cable.



7. Remove the shift lever assembly.

INSTALLATION

Installation is the reverse of the removal.

INSPECTION

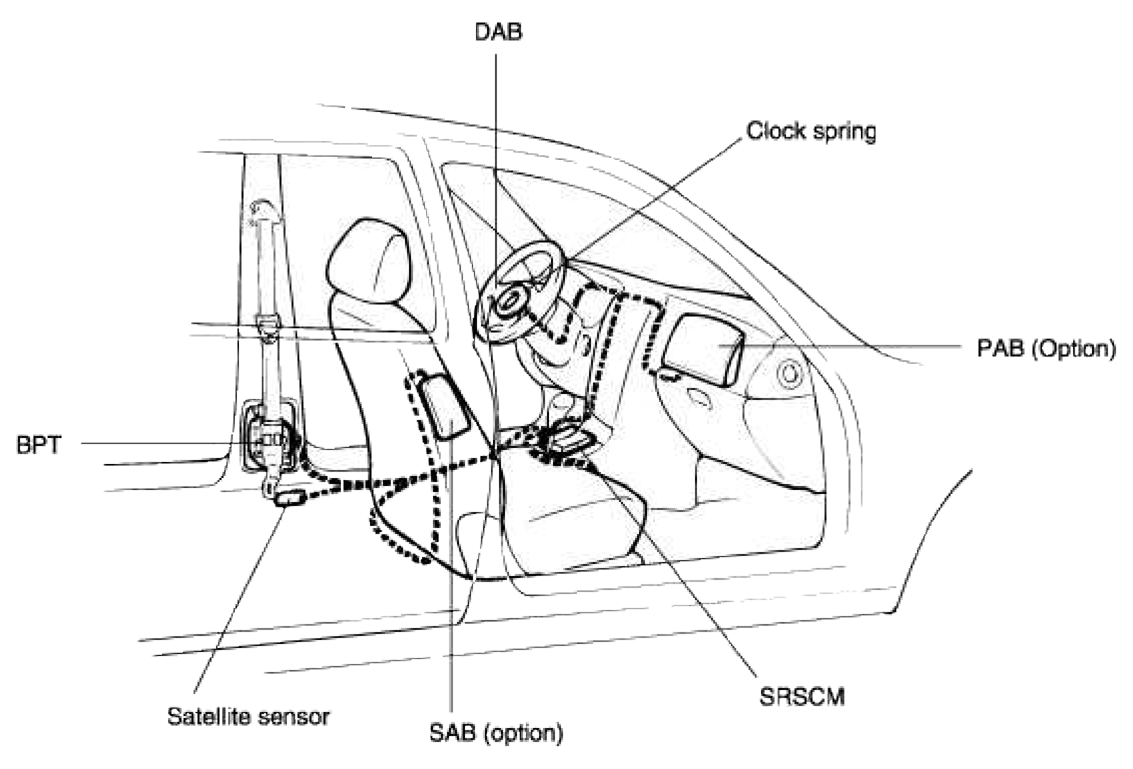
1. Check the select cable for proper operation and for damage.
2. Check the shift cable for proper operation and for damage.
3. Check the boot for damage.
4. Check each bushing for wear, abrasion, sticking, restricted movement or damage.
5. Check for a weak or damaged spring.

ACCENT(LC) > 2002 > G 1.5 SOHC > Restraint

Restraint > General Information > General Information

GENERAL

INFLATOR MODULE (DAB, PAB, SAB)



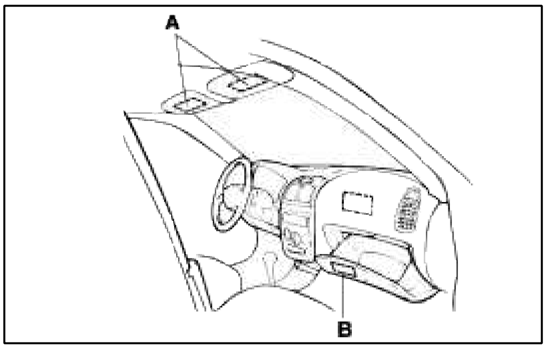
1. When removing the airbag module or handling a new airbag module, it should be placed with the pad top surface facing up. In this case, the twin-lock type connector lock lever should be in the locked state and care should be taken to place it so the connecter will not be damaged. Do not store a steering wheel pad on top of another one. (Storing the pad with its metallic surface up may lead to a serious accident if the airbag should inflate accidentally.)
2. Never measure the resistance of the airbag squib. (This may cause the airbag to deploy, which is very dangerous.)
3. Store the airbag module where the ambient temperature remains below 93°C (200°F), without high humidity and away from electrical noise.
4. During electric welding, disconnect the airbag under the steering column near the MULTI-FUNCTION SWITCH connector before starting work.

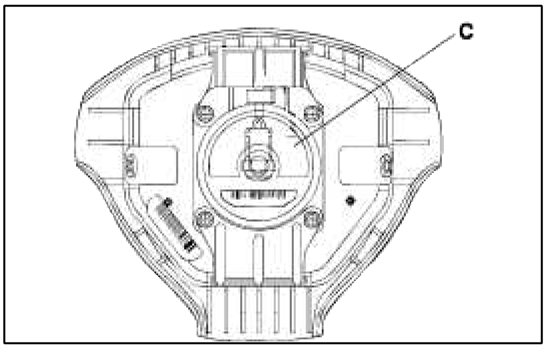
CUSTOMER CAUTIONS

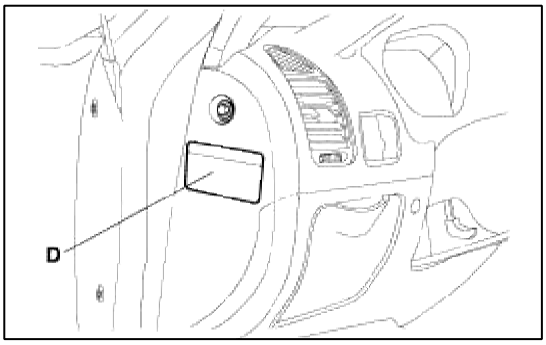
1. Be sure to proceed with airbag related service only after approx. 30 seconds or longer from the time the ignition switch is turned to the LOCK position and the negative (-) battery cable is disconnected from the battery. The airbag system is equipped with a back-up power source to assure the deployment of airbags when the battery cable is disconneted during an accident. The back-up power is available for approx. 150ms.
2. When the negative (-) battery cable is disconnected from the battery, the clock and audio system's memory will be wiped out. So before starting work, make a record of the contents of the audio system's memory. When the work is finished, reset the audio system and adjust the clock.
3. Symptoms of malfunction of the airbag system are difficult to detect, so the diagnostic codes become the most important source of information when troubleshooting.
4. When troubleshooting the airbag system, always inspect the diagnostic codes before disconnecting the battery.

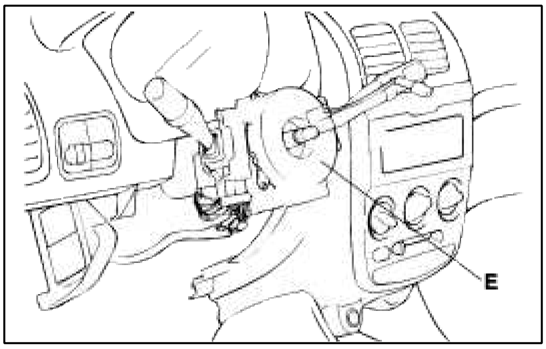
5. Never use airbag parts from another vehicle. When replacing parts, replace them with new parts.
6. Never attempt to disassemble and repair the airbag modules (DAB, PAB, SAB, BPT), clock spring and wiring in order to reuse them.
7. If any component of the SRS has been dropped, or if there are cracks, dents or other defects in the case, bracket or connector, replace them with new ones.
8. After work on the airbag system is completed, perform an SRS SRI check. The airbag indicator lamp can be triggered by faults in other circuit in some cases. Therefore if the airbag indicator lamp goes on, be sure to erase the DTC codes using the Hi-Scan Pro just after repairing or replacing the troubled parts, including the fuse.
9. Especially when performing body welding, never fail to disconnect the battery's negative (-) terminal.

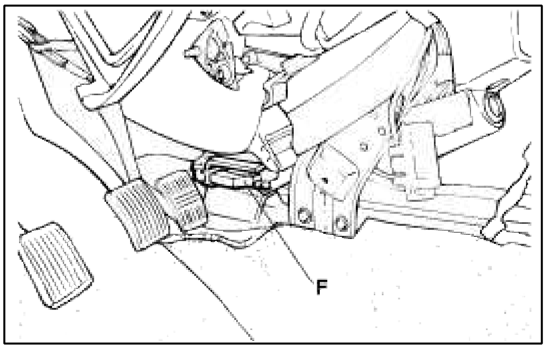
WARNING/CAUTION LABELS

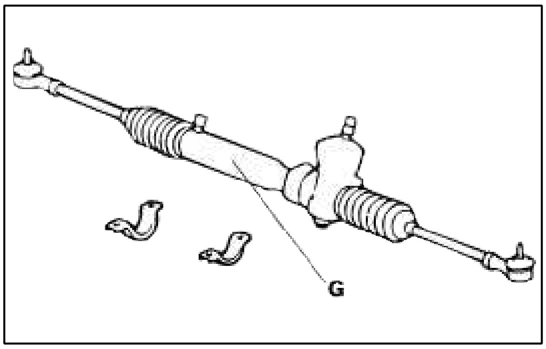








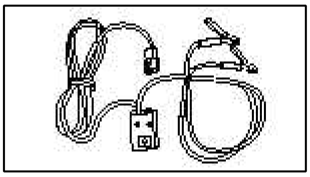
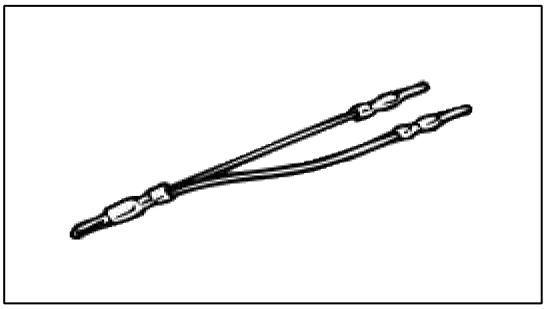
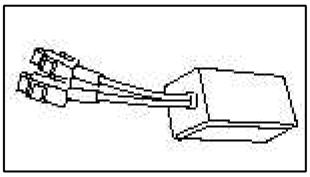




A. DAB + PAB **CAUTION** **TO AVOID SERIOUS INJURY :** • For maximum safety protection in all types of crashes, you must always wear your safety belt. • Do not install rearward-facing child seats in any front passenger seat position. • Do not sit or lean unnecessarily close to the airbag. • Do not place any objects over the airbag or between the airbag and yourself. • See the owner's manual for further information and explanation.	**B. SUPPLEMENTAL RESTRAINT SYSTEM (AIRBAG) INFORMATION** The airbag is a supplemental restraint system (SRS). You must always wear the seat belts. The airbag system condition is normal if the "SRS" lamp in the cluster flashes approximately 6 times after the ignition key is turned on and then goes out. If any of the following conditions occur, the system must be serviced : 1. "SRS" lamp does not light when key is turned on. 2. "SRS" lamp stays lit or flashes continuously. 3. The airbag has inflated. The airbag system must be inspected by an authorized dealer ten years after the vehicle manufacture date shown on the certification label located at the left front door opening area.
C. WARNING : Contents are poisonous and extremely flammable. Do not probe with electrical devices or otherwise tamper with item in any way. Servicing of this unit to be performed only by authorized personnel.	**D. WARNING** This car is equipped with a side airbag for each front seat. • Do not use any accessory seat covers. • Use of other seat covers could reduce the effect of the system. • Do not install any accessories on the side or near the side airbag. • Do not use excessive force on the side of the seat. • For further information, see owner's manual.
E. CAUTION : SRS clock spring This is not a repairable part. Do not disassemble or tamper with. If defective, replace entire unit as per service manual instructions. To re-center, rotate clockwise until tight. Then rotate in opposite direction approximately 3 turns and align →←. Failure to follow instructions may render SRS system inoperative possibly resulting in serious driver injury.	**F. CAUTION : AIRBAG ESPS UNIT** Detach connector before unmounting. Assemble strictly according to manual instructions.
G. CAUTION : SRS Before removal of steering gearbox, read service manual, center the front wheels and remove the ignition key. Failure to do so may damage SRS clock spring and render SRS system inoperative,possibly resulting in serious driver injury.	

Restraint > General Information > Special Service Tools

SPECIAL TOOLS

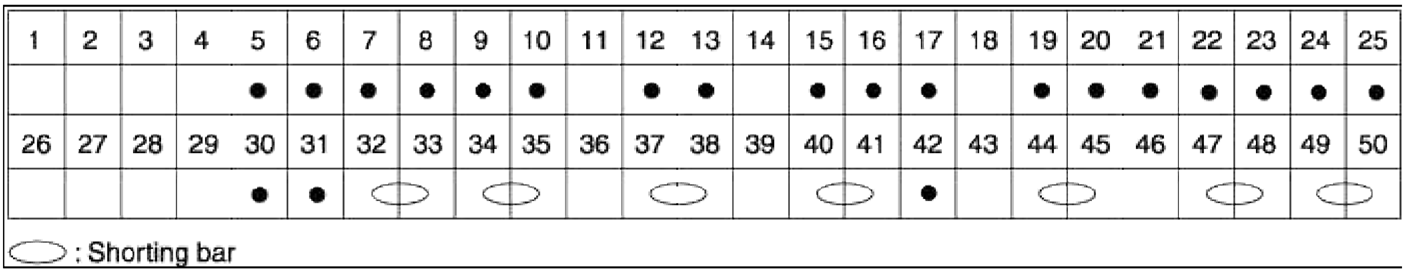
Tool (Number and name)	Illustration	Use
0957A-34100A Deployment tool		Airbag deployment adapter PAB, SAB: 0957A-38100 DAB, BPT: 0957A-38500 PAB (DUAL STAGE) : 0957A-25000
0957A-38000 Diagnosis checker		Wring harness checker for each module
0957A-38200 Dummy		Simulator to check the resistance of each wiring harnes Dummy adapter PAB, SAB: 0957A-38300 DAB, BPT: 0957A-38400 PAB (DUAL STAGE) : 0957A-25100

Restraint > Supplemental Restraint System Control Module (SRnodeM) > Schematic Diagrams

AIRBAG SYSTEM (SRS)

SRSCM CONNECTOR

DAB+PAB+SAB+BPT (SRE-LC)



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
				●	●	●	●	●	●		●	●		●	●	●		●	●	●	●	●	●	●
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
				●	●	⬭		⬭			⬭			⬭		●		⬭			⬭		⬭	

⬭ : Shorting bar

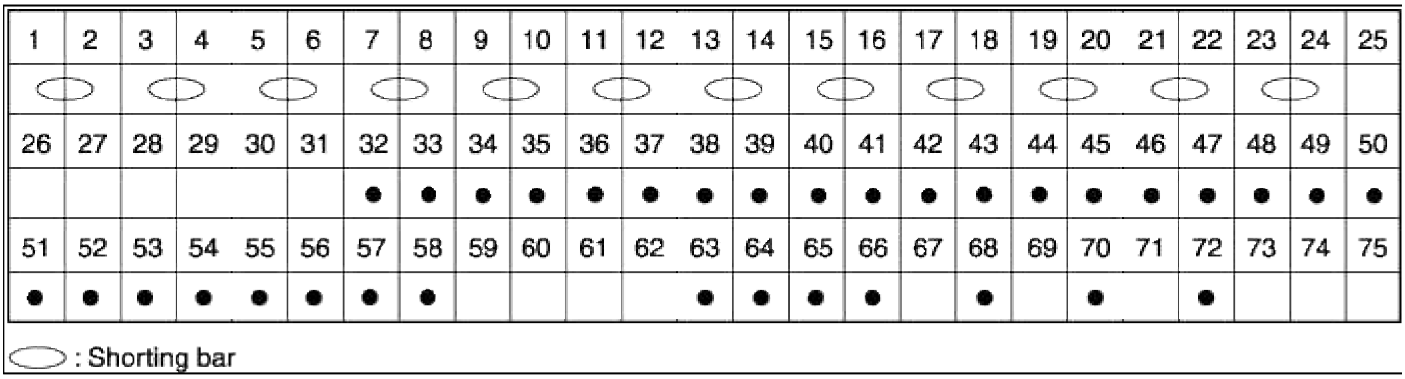
CONNECTOR

PIN NO.	FUNCTION	INPUT/OUTPUT
1	-	-
2	-	-
3	-	-
4	-	Output
5	Passenger satellite sensor, High	Output

6	Driver satellite sensor, High	Output
7	Driver belt pretensioner, Low	Output
8	Driver belt pretensioner, High	Output
9	Passenger belt pretensioner, High	Output
10	Passenger belt pretensioner, Low	Output
11	-	-
12	Passenger airbag, Low	Output
13	Passenger airbag, High	Output
14	-	-
15	Driver airbag, Low	Output
16	Driver airbag, High	Output
17	K-diagnostic line	Input/output
18	-	-
19	Warning lamp	Output
20	GND	Input
21	Battery supply	Input
22	Driver side airbag, High	Output
23	Driver side airbag, Low	Output
24	Passenger side airbag, LOW	Output
25	Passenger side airbag, High	Output
26	-	-
27	-	-
28	-	-
29	-	-
30	Passenger satellite sensor, Low	Output
31	Driver satellite sensor, Low	Output
32-33	Shorting bar	-
34-35	Shorting bar	-
36	-	-
37-38	Shorting bar	-
39	-	-
40-41	Shorting bar	-
42	Crash output	Output
43	-	-
44-45	Shorting bar	-

46	-	-
47-48	Shorting bar	-
49-50	Shorting bar	-

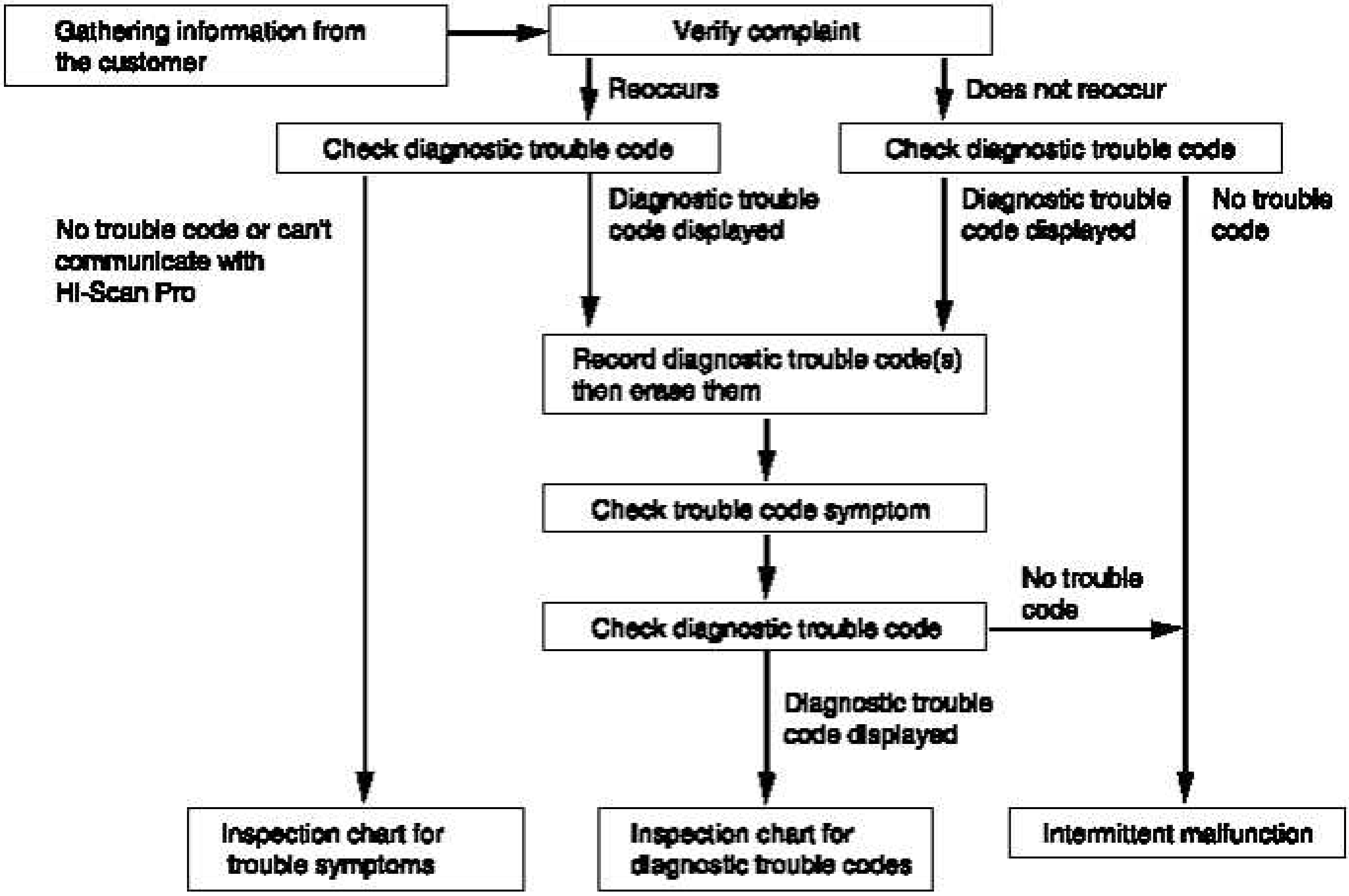
DAB+PAB+SAB+BPT (DUAL-STAGE AIRBAG)



PIN NO.	FUNCTION	INPUT/OUTPUT
1-24	Shorting bar	-
25	-	-
26	-	-
27	-	-
28	-	-
29	-	-
30	-	-
31	-	-
32	Passenger airbag stage 2, Low	Output
33	Passenger airbag stage 2, High	Output
34	Driver airbag stage 2, High	Output
35	Driver airbag stage 2, Low	Output
36	Passenger side airbag, Low	Output
37	Passenger side airbag, High	Output
38	Driver side airbag, High	Output
39	Driver side airbag, Low	Output
40	Passenger belt pretensioner, Low	Output
41	Passenger belt pretensioner, High	Output
42	Driver belt pretensioner, High	Output
43	Driver belt pretensioner, Low	Output
44	Passenger airbag, Low	Output
45	Passenger airbag, High	Output
46	Driver airbag, High	Output

47	Driver airbag, LOW	Output
48	Ground	Input
49	Warning lamp	Output
50	Battery supply	Input
51	Driver electronic frontal sensor, Low	Input/output
52	Driver electronic frontal sensor, High	Input/output
53	Passenger electronic frontal sensor, High	Input/output
54	Passenger electronic frontal sensor, Low	Input/output
55	Driver satellite sensor, Low	Input/output
56	Driver satellite sensor, High	Input/output
57	Passenger satellite sensor, High	Input/output
58	Passenger satellite sensor, Low	Input/output
59-62	-	-
63	Passenger seat track sensor	Intput
64	Passenger seat buckle switch	Intput
65	Driver seat buckle switch	Intput
66	Driver seat track sensor	Intput
67	-	-
68	Enhanced crash output	Output
69	-	-
70	Crash output	Output
71	-	-
72	K-diagnostic line	Input/output
73-75	-	-

DIAGNOSTIC TROUBLESHOOTING FLOW



Gathering information from the customer
Verify complaint
Reoccurs
Does not reoccur
Check diagnostic trouble code
Check diagnostic trouble code
No trouble code or can't communicate with Hi-Scan Pro
Diagnostic trouble code displayed
Diagnostic trouble code displayed
No trouble code
Record diagnostic trouble code(s) then erase them
Check trouble code symptom
No trouble code
Check diagnostic trouble code
Diagnostic trouble code displayed
Inspection chart for trouble symptoms
Inspection chart for diagnostic trouble codes
Intermittent malfunction

AIRBAG SQUIB RESISTANCE LIMITS (SRE-LC)

DAB

R ≤ 1.06Ω	Resistance too low	Fault definitely detected
1.8Ω ≤ R ≤ 3.4Ω	Resistance within tolerance	Definitely no fault detected
R ≥ 6.7Ω	Resistance too high	Fault definitely detected
1.06Ω < R < 1.8Ω 3.4Ω < R < 6.7Ω	Tolerance band	Fault may or may not be detected

PAB, SAB, BPT

R ≤ 0.4Ω	Resistance too low	Fault definitely detected
1.6Ω ≤ R ≤ 2.8Ω	Resistance within tolerance	Definitely no fault detected
R ≥ 5.4Ω	Resistance too high	Fault definitely detected
0.4Ω < R < 1.6Ω 2.8Ω < R < 5.4Ω	Tolerance band	Fault may or may not be detected

SRE-SMART : DUAL STAGE AIRBAG

DAB, DAB (2ND STAGE)

$R \leq 0.9\Omega$	Resistance too low	Fault definitely detected
$1.6\Omega \leq R \leq 4.1\Omega$	Resistance within tolerance	Definitely no fault detected
$R \geq 6.0\Omega$	Resistance too high	Fault definitely detected
$1.9\Omega < R < 1.6\Omega$ $4.1\Omega < R < 6.0\Omega$	Tolerance band	Fault may or may not be detected

PAB, SAB, PAB(2nd stage)

$R \leq 1.0\Omega$	Resistance too low	Fault definitely detected
$1.8\Omega \leq R \leq 2.8\Omega$	Resistance within tolerance	Definitely no fault detected
$R \geq 4.2\Omega$	Resistance too high	Fault definitely detected
$1.0\Omega < R < 1.8\Omega$ $2.8\Omega < R < 4.2\Omega$	Tolerance band	Fault may or may not be detected

BPT

$R \leq 0.9\Omega$	Resistance too low	Fault definitely detected
$1.8\Omega \leq R \leq 3.1\Omega$	Resistance within tolerance	Definitely no fault detected
$R \geq 4.7\Omega$	Resistance too high	Fault definitely detected
$0.9\Omega < R < 1.8\Omega$ $3.1\Omega < R < 4.7\Omega$	Tolerance band	Fault may or may not be detected

Restraint > Supplemental Restraint System Control Module (SRnodeM) > Description and Operation

SRSCM

SRSCM (Supplement Restraint System Control Module)

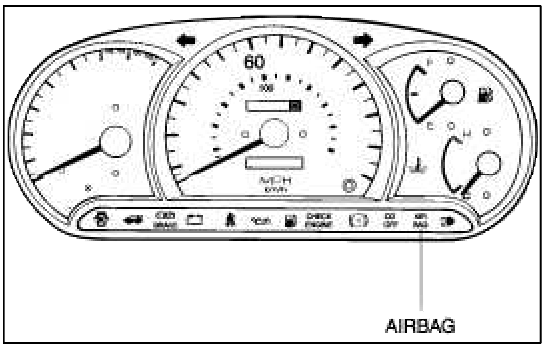
1. DC/DC convertor : The DC/DC converter in the power supply includes a step-up and a step-down converter, which provides the firing voltage for four firing circuits and the internal operating voltage. If the internal operating voltage falls below a defined threshold, a reset is executed.
2. Arming sensor/safing sensor : The arming/safing sensor built in to the airbag firing circuit has the function of arming the airbag circuit under all required deployment conditions and maintaining the airbag firing circuits unarmed under normal driving conditions. The safing sensor is a dual-contact electromechanical switch that closes if it experiences a deceleration exceeding a specified threshold.
3. Back-up power : The SRSCM reserves an energy reserve to provide deployment energy for a short period when the vehicle voltage is low or if lost in a vehicle frontal crash.
4. Malfunction detection : The SRSCM continuously monitors SRS operating status while the ignition key is turned on and detects possible malfunctions in the system. The malfunction can be displayed in the form of a diagnostic trouble codes using the Hi-Scan Pro.
5. MIL (Malfunction Indication Lamp) notification : If any fault is detected, the SRSCM sends a signal to the indicator lamp on the instrument cluster to warn the vehicle driver.
   The MIL indicator is the key item in notifying the driver of SRS faults. It verifies lamp and SRSCM operation by flashing 6 times when the ignition switch is first turned on.
6. Malfunction recording : Once a fault occurs in the system, the SRSCM records the fault in memory in the form of a DTC, which can only be erased by the Hi-Scan Pro.
7. Data link connector : SRSCM memory stored is linked through this connector located underneath the driver side crash pad to an external output device such as the Hi-Scan Pro.

8. What if only BPT's deploy.
9. Crash output

   The crash output is used to unlock the doors in case of a crash. The crash output is : 0-200 µA in OFF mode and 200mA in ON mode. During the unlock command, the switch is closed for 200 mS.

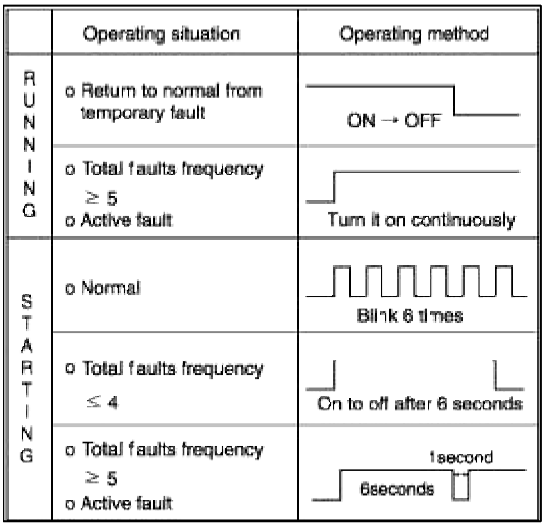
SRS HARNESS

SRSCM INDEPENDENT LAMP ACTIVATION



1. Loss of ignition voltage supply to the SRSCM : lamp turned on continuously.
2. Loss of internal operating voltage: lamp turned on continuously.
3. SRSCM not connected: lamp turned on through shorting bar in wiring harness connector.

MIL OPERATING METHOD



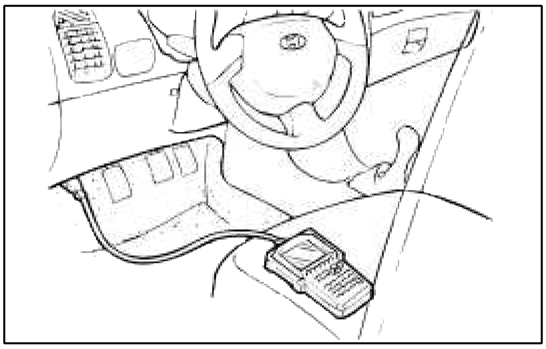
	Operating situation	Operating method
RUNNING	o Return to normal from temporary fault	ON → OFF
	o Total faults frequency ≥ 5 o Active fault	Turn it on continuously
STARTING	o Normal	Blink 6 times
	o Total faults frequency ≤ 4	On to off after 6 seconds
	o Total faults frequency ≥ 5 o Active fault	1second 6seconds

DIAGNOSIS WITH SCAN TOOL

CHECK PROCEDURES

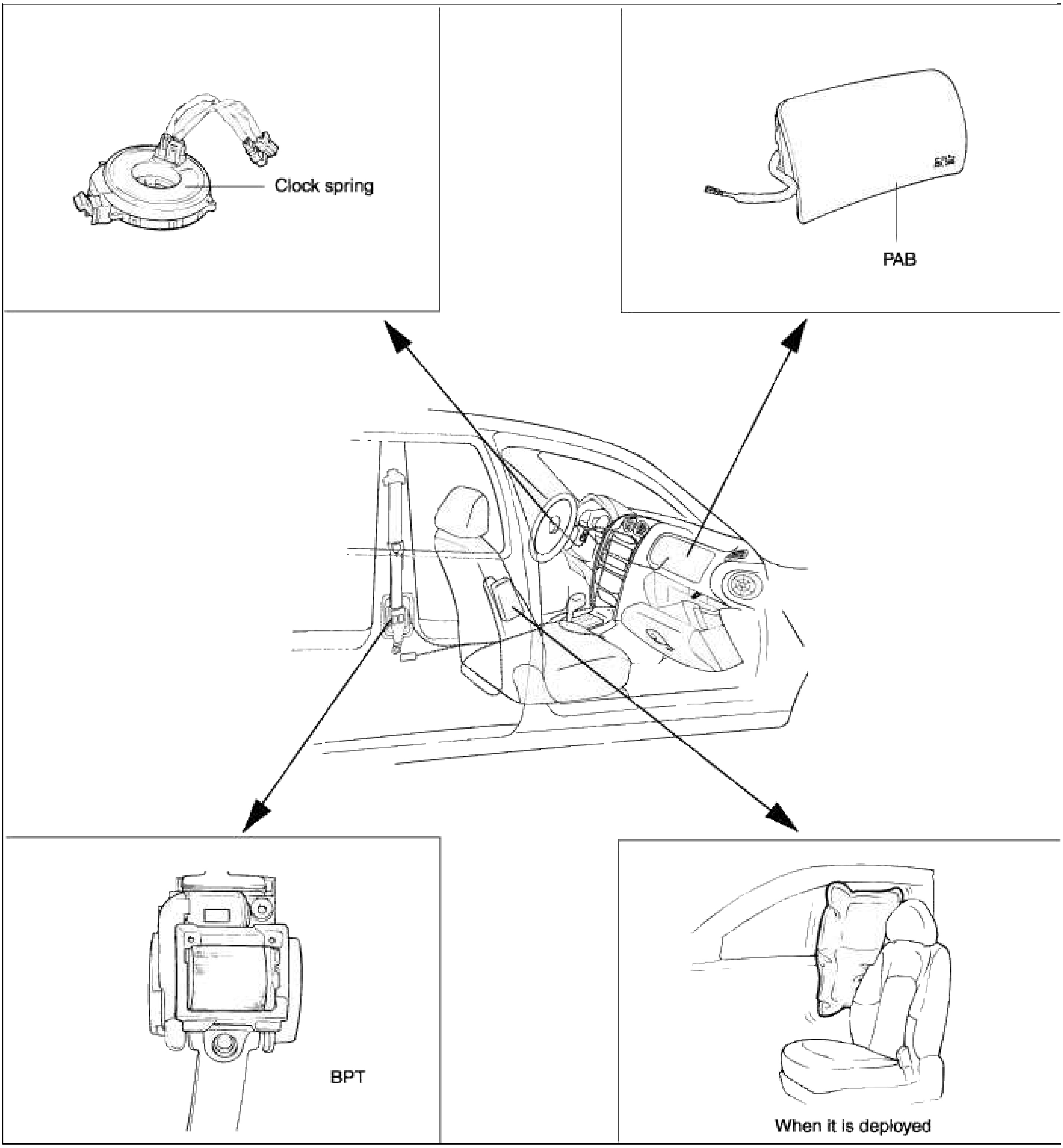
1. Connect the Hi-Scan Pro DLC to the vehicle's data link connector located underneath the dash panel.
2. Turn the ignition key to the "ON" position and turn the Hi-Scan Pro ON.
3. Perform the SRS diagnosis according to the vehicle model configuration.
4. If a fault code is assured, then replace the component. Never attempt to repair the component.

5. If the Hi-Scan Pro finds that a component of the system is faulty, there is a possibility that the fault is not in the component, but in SRS wiring or connector.

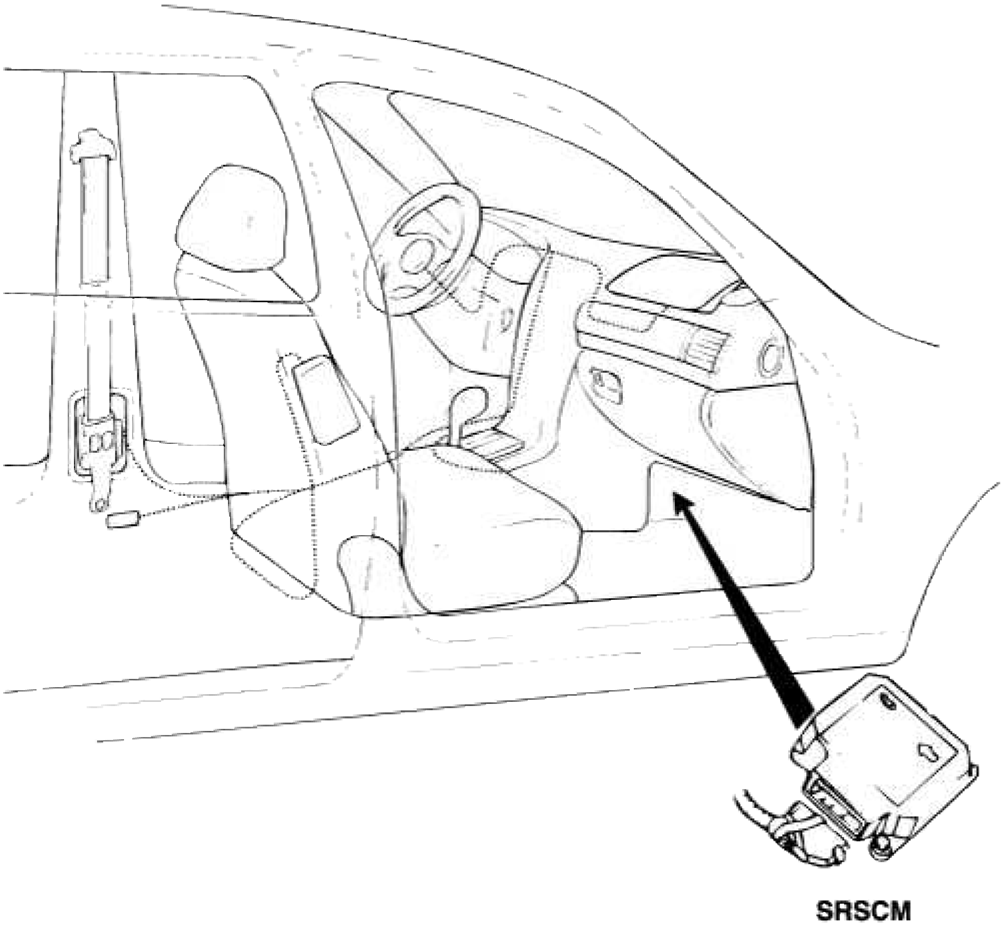


Restraint > Supplemental Restraint System Control Module (SRnodeM) > Components and Components Location

SYSTEM COMPONENT AND LAYOUT


Clock spring
PAB
BPT
When it is deployed

SRSCM (SRS CONTROL MODULE)



Restraint > Supplemental Restraint System Control Module (SRnodeM) > Troubleshooting

INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODE

OPTIONS : DAB + PAB + SAB + BPT (SRE-LC)

DTC No.	Fault description
B1111	Battery voltage too high
B1112	Battery voltage too low
B1346	Driver airbag (DAB), Resistance too high
B1347	Driver airbag (DAB), Resistance too low

B1348	Driver airbag (DAB), Short to ground
B1349	Driver airbag (DAB), Short to Battery
B1352	Passenger airbag (PAB), Resistance too high
B1353	Passenger airbag (PAB), Resistance too low
B1354	Passenger airbag (PAB), Short to ground
B1355	Passenger airbag (PAB), Short to Battery
B1361	Driver seat belt pretensioner (DBPT), Resistance too high
B1362	Driver seat belt pretensioner (DBPT), Resistance too low
B1363	Driver seat belt pretensioner (DBPT), Short to ground
B1364	Driver seat belt pretensioner (DBPT), Short Battery
B1367	Passenger seat belt pretensioner (PBPT), Resistance too high
B1368	Passenger seat belt pretensioner (PBPT), Resistance too low
B1369	Passenger seat belt pretensioner (PBPT), Short to ground
B1370	Passenger seat belt pretensioner (PBPT), Short to Battery
B1378	Driver side airbag (DSAB), Resistance too High
B1379	Driver side airbag (DSAB), Resistance too Low
B1380	Driver side airbag (DSAB), Short to ground
B1381	Driver side airbag (DSAB), Short to Battery
B1382	Passenger side airbag (PSAB), Resistance too high
B1383	Passenger side airbag (PSAB), Resistance too low
B1384	Passenger side airbag (PSAB), Short to ground
B1385	Passenger side airbag (PSAB), Short to Battery
B1400	Satellite left side sensor defect
B1401	Satellite left side short to ground
B1402	Satellie left side short to battery
B1403	Satellite right side sensor defect
B1404	Satellite right side short to ground
B1405	Satellite right side short to battery
B1620	Internal failure
B1650	Crash recorded (Frontal repace SRE-HMC)
B1661	Parameter configuration missing/incorrect
B2500	Warning lamp failure

NOTE

- The DAB is located in the steering wheel.
- The PAB is located in the crash pad.
- The DSAB is located in the left side of driver's seat.
- The PSAB is located in the right side of passenger's seat.

OPTIONS : DAB+PAB+SAB+BPT (DUAL STAGE AIRBAG)

DTC No.	Fault description
B1101	Battery voltage too high
B1102	Battery voltage too low
B1103	Communication voltage too low
B1326	Driver side electronic frontal sensor short to ground
B1327	Driver side electronic frontal sensor short to battery
B1328	Driver side electronic frontal sesnor defect
B1329	Driver side electronic frontal sesnor communication error
B1330	Driver side electronic frontal sesnor wrong ID
B1331	Passenger side eelectronic frontal sesnor short to ground
B1332	Passenger side electronic frontal sesnor short to battery
B1333	Passenger side electronic frontal sesnor defect
B1334	Passenger side electronic frontal sesnor communication error
B1335	Passenger side electronic frontal sesnor wrong ID
B1346	Driver airbag (DAB), Resistance too high
B1347	Driver airbag (DAB), Resistance too low
B1348	Driver airbag (DAB), Short to ground
B1349	Driver airbag (DAB), Short to Battery
B1352	Passenger airbag (PAB), Resistance too high
B1353	Passenger airbag (PAB), Resistance too low
B1354	Passenger airbag (PAB), Short to ground
B1355	Passenger airbag (PAB), Short to Battery
B1361	Driver seat belt pretensioner (DBPT), Resistance too high
B1362	Driver seat belt pretensioner (DBPT), Resistance too low
B1363	Driver seat belt pretensioner (DBPT), Short to ground
B1364	Driver seat belt pretensioner (DBPT), Short Battery
B1367	Passenger seat belt pretensioner (PBPT), Resistance too high
B1368	Passenger seat belt pretensioner (PBPT), Resistance too low
B1369	Passenger seat belt pretensioner (PBPT), Short to ground
B1370	Passenger seat belt pretensioner (PBPT), Short to Battery

B1378	Driver side airbag (DSAB), Resistance too High
B1379	Driver side airbag (DSAB), Resistance too Low
B1380	Driver side airbag (DSAB), Short to ground
B1381	Driver side airbag (DSAB), Short to Battery
B1382	Passenger side airbag (PSAB), Resistance too high
B1383	Passenger side airbag (PSAB), Resistance too low
B1384	Passenger side airbag (PSAB), Short to ground
B1385	Passenger side airbag (PSAB), Short to Battery
B1387	Driver seat-track position sensor short to ground
B1388	Driver seat-track position sensor short to battery
B1389	Driver seat-track position sensor defect
B1390	Passenger seat-track position sensor short to ground
B1391	Passenger seat-track position sensor short to battery
B1392	Passenger seat-track position sensor defect
B1395	Firing loop interconnection fault
B1400	Satellite left side sensor defect
B1401	Satellite left side short to ground
B1402	Satellite left side short to battery
B1403	Satellite right side sensor defect
B1404	Satellite right side short to ground
B1405	Satellite right side short to battery
B1409	Satellite left side communication error
B1410	Satellite right side communication error
B1414	Satellite sensor left side wrong ID
B1415	Satellite sensor right side wrong ID
B1481	2nd stage driver airbag, Resistance too high
B1482	2nd stage driver airbag, Resistance too low
B1483	2nd stage driver airbag, Short to ground
B1484	2nd stage driver airbag, Short to battery
B1485	2nd stage passenger airbag, Resistance too high
B1486	2nd stage passenger airbag, Resistance too low
B1487	2nd stage passenger airbag, Short to ground
B1488	2nd stage passenger airbag, Short to battery
B1511	Driver seat buckle switch short to battery
B1512	Driver seat buckle switch short to ground
B1513	Passenger seat buckle switch short to battery

B1514	Passenger seat buckle switch short to ground
B1515	Driver seat buckle switch defect
B1516	Passenger seat buckle switch defect
B1620	Internal failure
B1650	Crash recorded (Frontal-Replace SRE-SMART)
B1651	Crash recorded driver side airbag (Side Airbag-Replace SRE-SMART)
B1652	Crash recorded passenger side airbag (Side Airbag-Replace SRE-SMART)
B1657	Crash recorded-belt pretensioner only
B1670	2nd stage crash recorded (Frontal Airbag-Replace SRE-SMART)
B2500	Warning lamp failure
B2502	Passenger deactivation lamp failure

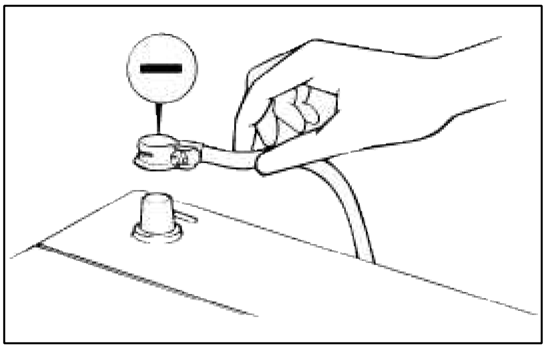
Restraint > Supplemental Restraint System Control Module (SRnodeM) > Repair procedures

REMOVAL

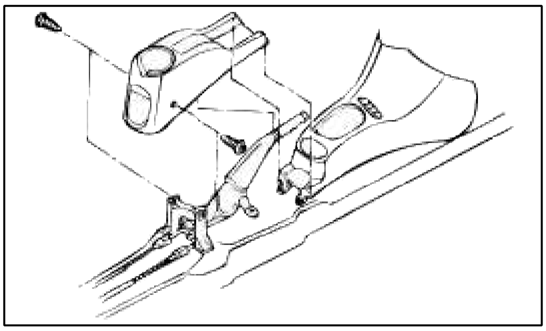
1. Disconnect the negative battery cable and keep secure from battery.

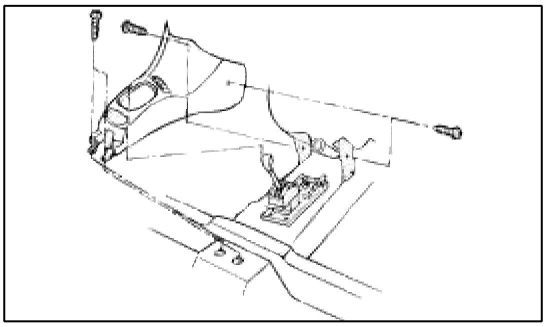
CAUTION

Wait at least 30 seconds after disconnecting the battery cable before doing any further work.

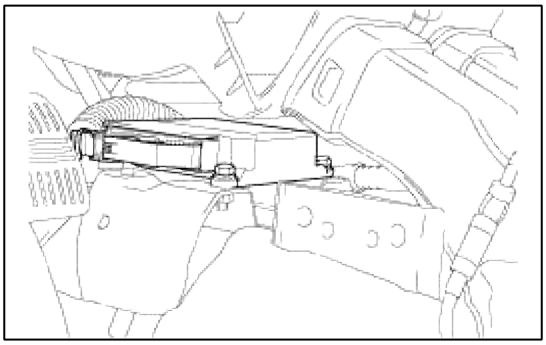


2. Remove the center console mounting bolts (10mm).





3. Remove the center console.
4. Disconnect the SRSCM connector.
5. Remove the SRSCM (10mm).



NOTE

- Do not damage the SRSCM terminals or connectors.
- Do not disassemble the SRSCM; It has no serviceable parts.
- Store the SRSCM in a clean, dry area.
- Do not use any SRSCM which has been subjected to water or shows sign of being dropped or improperly handled, such as dents, cracks or deformation.

6. After installing the SRSCM, confirm proper system operation: Turn the ignition switch ON ; the SRS indicatior light should come on for about six seconds and then go off.

Restraint > Airbag Module > Description and Operation

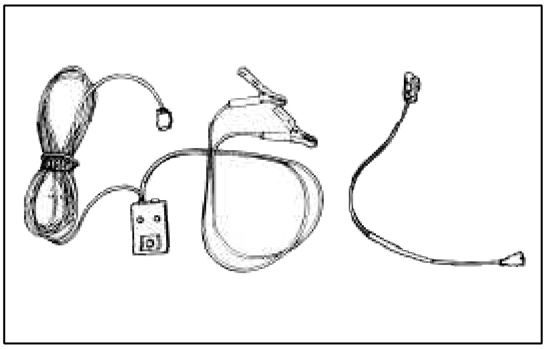
FIELD DEPLOYMENT PROCEDURES

WARNING

When handling the deployed airbag be careful that not the dust enters your eyes and always wear gloves to avoid direct contact with the dust.

AIRBAG MODULE DISPOSAL PROCEDURES

AIRBAG REMOTE DEPLOYMENT DEVICES

Tool, Number, Name	Use
Deployment tool (0957A-34100A) SRS DEPLOYMENT ADAPTER HARNESS DAB, BPT : 0957A-38500 PAB, SAB : 0957A-38100 PAB (DUAL STAGE) : 0957A-2500 	Deployment inside the vehicle (if the vehicle will no longer be driven)

DISPOSAL PLAN

CASE		DISPOSAL PLAN
Abnormal problems in airbag module		Deploy and discard
Car scrapping	DAB, PAB, BPT, SAB	Deploy the airbag module with the SST
Crash (Deployed)		Discard

UNDEPLOYED AIRBAG MODULE DISPOSAL

CAUTION

1. If the vehicle is to be scrapped, junked, or otherwise disposed of, deploy the airbag inside the vehicle.
2. Since there is a loud noise when the airbag is deployed, avoid residential areas whenever possible. If anyone is nearby, give warning of the impending noise.
3. Since a large amount of smoke is produced when the airbag is deployed, select a well-ventilated site. Moreover, never attempt the test near a fire or smoke sensor.

DEPLOYMENT INSIDE THE VEHICLE

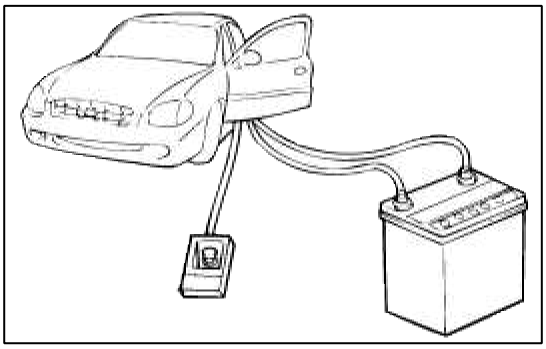
when vehicle will no longer be driven

1. Open all windows and doors of the vehicle. Move the vehicle to an isolated spot.
2. Disconnect the negative (-) and positive (+) battery cables from the battery terminals, and then remove the battery from the vehicle.

> WARNING
>
> Wait at least 30 seconds after disconnecting the battery cable before doing any further work.

3. Remove the center crash pad side cover.
4. Remove Airbag SRSCM connector.
5. Connect deployment tool to the connector of each module.

6. At location as far away from the vehicle as possible, press the push button (removed from the vehicle) to deploy the airbag.

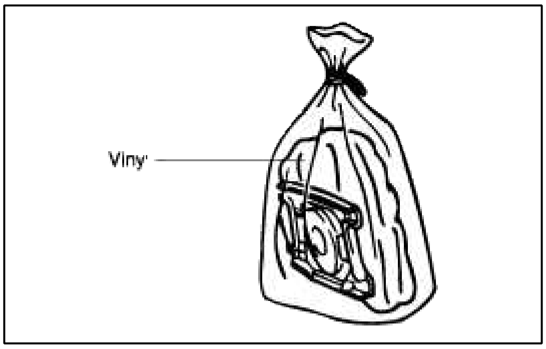


WARNING

1. Before deploying the airbag in this manner, first check to be sure that there is no one in or near the vehicle. Wear safety glasses.
2. The inflator will be quite hot immediately following the deployment, so wait at least 30 minutes to allow it to cool before attempting to handle it. Although not poisonous, do not inhale gas from airbag deployment. See Deployed Airbag Module Disposal Procedures for post-deployment handling instructions.
3. If the airbag fails to deploy when the procedures above are followed, do not go near the module. Contact your local distributor.

DEPLOYED AIRBAG MODULE DISPOSAL PROCEDURES

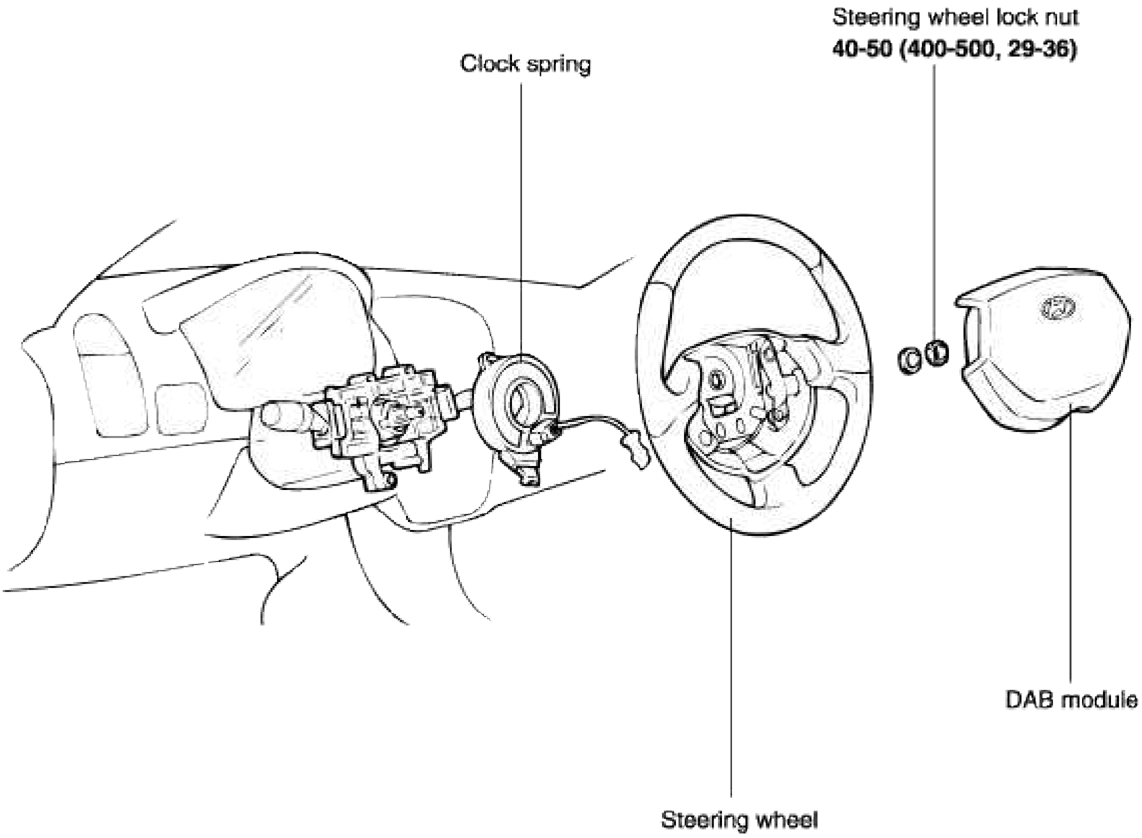
1. The inflator will be quite hot immediately following deployment, so wait at least 30 minutes to allow it to cool before attempting to handle it.
2. Do not put water or oil on the airbag after deployment.
3. There may be adhered to the deployed airbag module, material that could irritate the eyes and/or skin, so wear gloves and safety glasses when handling a deployed airbag module. If despite these precautions, the material does get into your eyes or on your skin, immediately rinse the affected area with a large amount of clean water. If any irritation develops, seek medical attention.
4. Tightly seal the airbag module in a strong vinyl bag for disposal.



5. Be sure to always wash your hands after completing this operation.

Restraint > Airbag Module > Components and Components Location

COMPONENTS

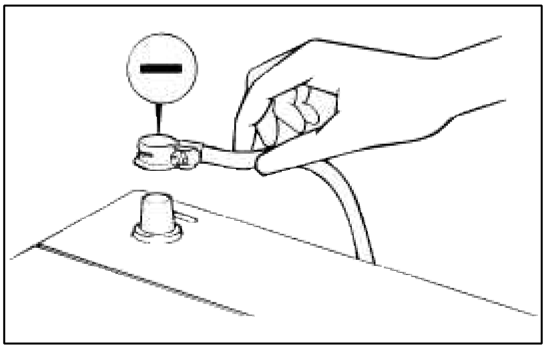

Steering wheel lock nut
40-50 (400-500, 29-36)
Clock spring
DAB module
Steering wheel

TORQUE : Nm (kg-m, lb-t)

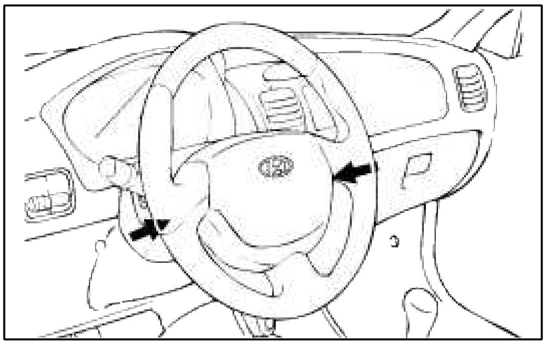
Restraint > Airbag Module > Repair procedures

REMOVAL

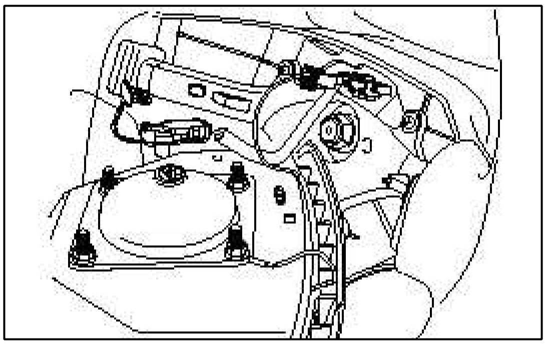
1. Disconnect the negative battery cable and keep secure from battery.

> **WARNING**
>
> Wait at least 30 seconds after disconnecting the battery cable before doing any further work.
>
> 

2. Remove the side protect cover of steering wheel and airbag module mounting bolts using a hexagonal wrench.



3. Disconnect the drive airbag module connector.

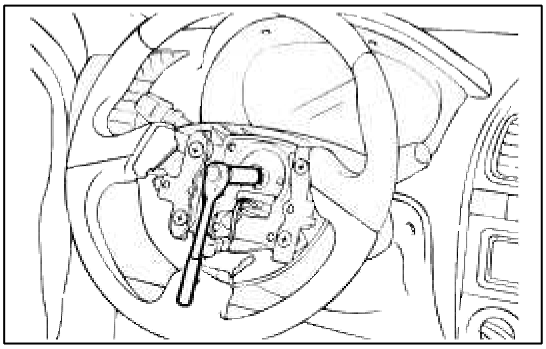


> **WARNING**
>
> The removed airbag module should be stored in a clean, dry place with the pad cover face up.

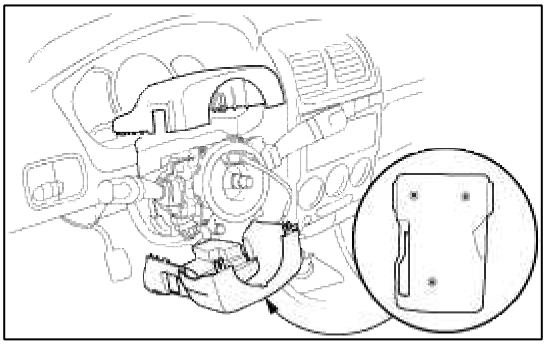
4. Remove the steering wheel using SST (09561-11002).

CAUTION

Do not hammer on the steering wheel. Doing so may damage the collapsible column mechanism.



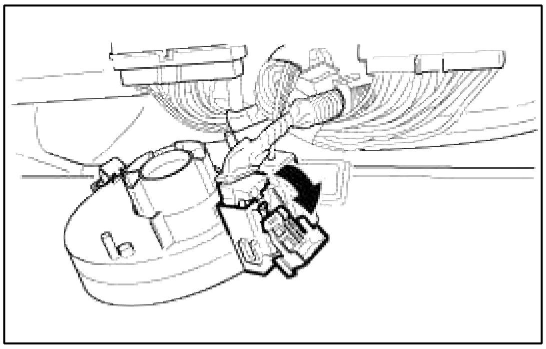
5. Remove the steering column upper shroud and lower shroud.

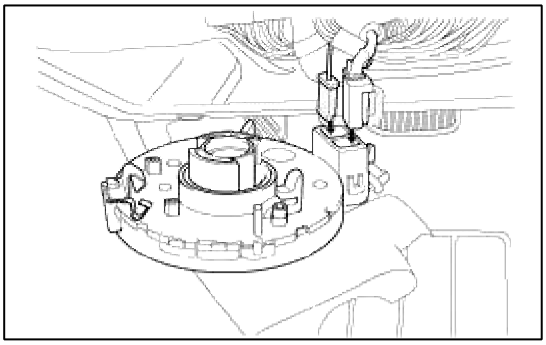


6. When disconnecting the connector of the clock spring from the airbag module, pull the airbag's lock toward the outer side to spread it open.

CAUTION

When disconnecting the airbag module-clock spring connector, take care not to apply excessive force to it.





INSPECTION

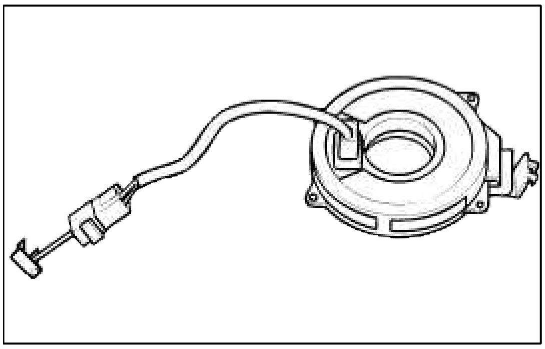
AIRBAG MODULE

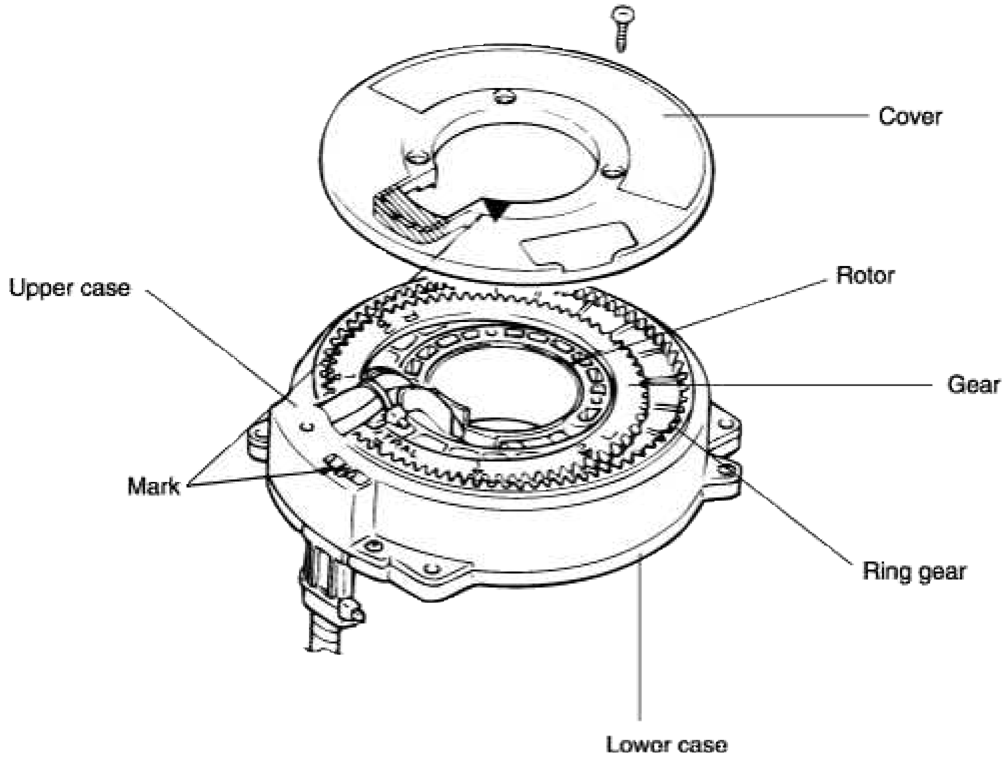
WARNING

Never attempt to measure the circuit resistance of the airbag module (squib) even if you are using the specified tester. If the circuit resistance is measured with a tester, accidental airbag deployment will result in serious personal injury.

1. Check pad cover for dents, cracks or deformities.
2. Check the airbag module for denting, cracking or deformation.
3. Check hooks and connectors for damage, terminals for deformities, and harness for binds.
4. Check airbag inflator case for dents, cracks or deformities.
5. Install the airbag module to the steering wheel to check for fit or alignment with the wheel.

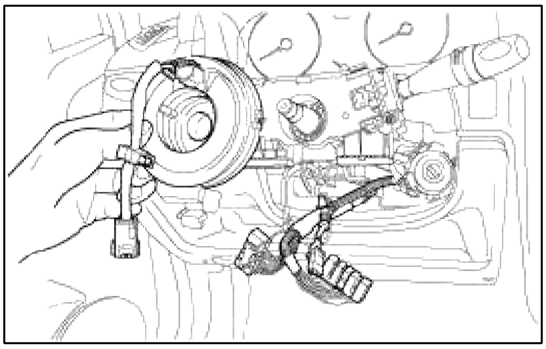
CLOCK SPRING





When the rotor is rotated clockwise

1. If, as a result of the following checks, even one abnormal point is discovered, replace the clock spring with a new one.
2. Check connectors and protective tube for damage, and terminals for deformities.



Restraint > Airbag Module > Passenger Airbag (PAB) Module > Repair procedures

REMOVAL

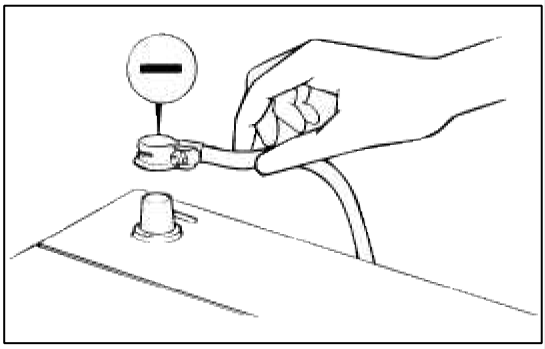
WARNING

1. Never attempt to disassemble or repair the airbag module.
2. Do not drop the airbag module or allow contact with water, grease or oil. Replace it if a dent, crack, deformation or rust are detected.
3. The airbag module should be stored on a flat surface and placed so that the pad surface is facing upward. Do not place anything on top of it.
4. Do not expose the airbag module to temperature over 93°C (200°F)
5. An undeployed airbag module should only be disposed in accordance with the procedures.
6. Never attempt to measure the circuit resistance of the airbag module (squib) even if you are using the specified tester. If the circuit resistance is measured with a tester, accidental airbag deployment will result in serious personal injury.
7. Whenever the PAB is deployed it should be replaced with a new one assembled with an extension wire. The squib is melt down if the PAB is deployed making the extension wire useless.

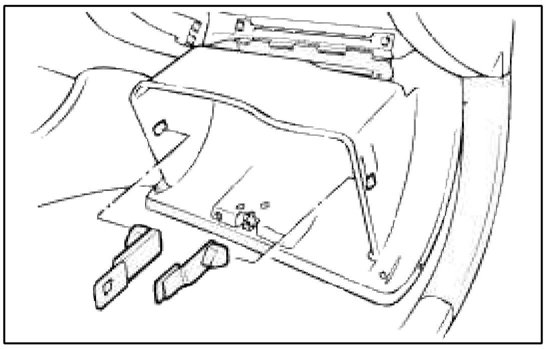
1. Disconnect the battery negative (-) terminal cable.

CAUTION

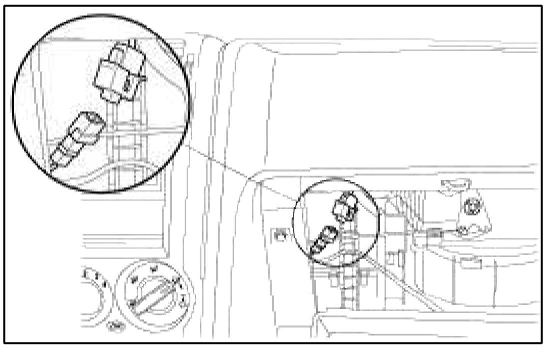
Wait at least 30 seconds.



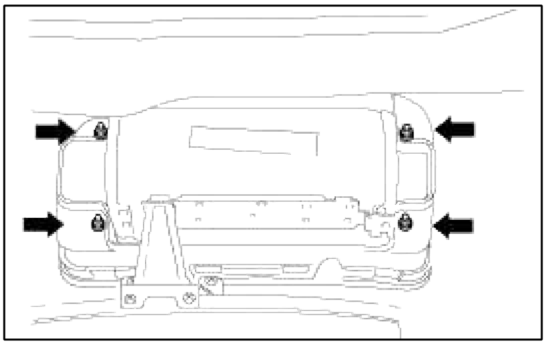
2. Remove the glove box.

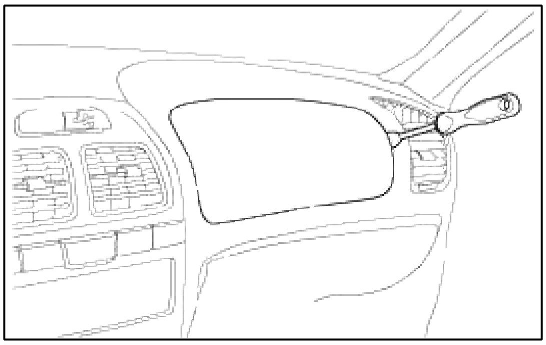


3. Disconnect the PAB module connector.



4. Remove the crash pad assembly and then undo the PAB module. (Refer to the BD section)





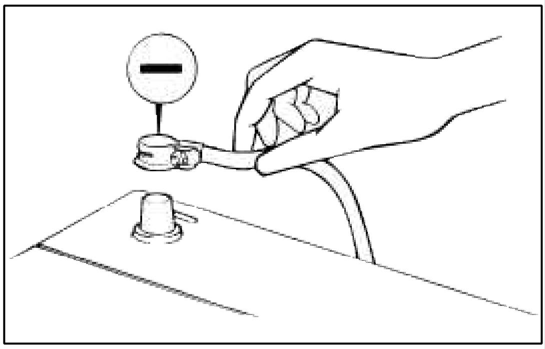
Restraint > Airbag Module > Side Airbag (SAB) Module > Repair procedures

REMOVAL

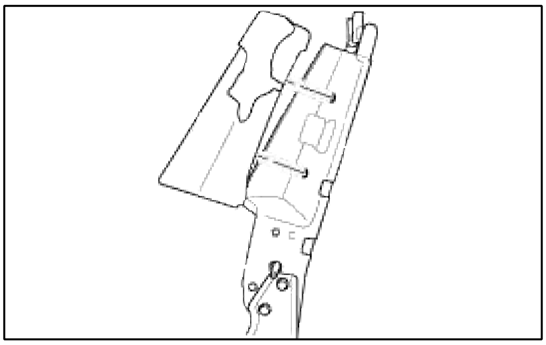
1. Disconnect the battery negative (-) terminal cable.

CAUTION

Wait at least 30 seconds.



2. Disconnect the side airbag harness 2p connector.
3. Remove the seat assembly and seat-back cover.
4. Remove the two mounting nuts and the side airbag.



WARNING

1. Never attempt to disassemble or repair the airbag module.
2. Do not drop the airbag module or allow contact with water, grease or oil. Replace it if a dent, crack, deformation or rust are detected.
3. The airbag module should be stored on a flat surface and placed so that the pad surface is facing upward. Do not place anything on top of it.
4. Never attempt to measure the circuit resistance of the airbag module (squib) even if you are using the specified tester. If the circuit resistance is measured with a tester, accidental airbag deployment will result in serious personal injury.

Restraint > Airbag Module > Satellite Sensor > Description and Operation

SATELLITE SENSOR

WARNING

When the ignition is ON, never cause a sudden shock around the installation area of the satellite sensor by a hammer, etc. Otherwise it could cause the airbag system to unexpectedly deploy during servicing.

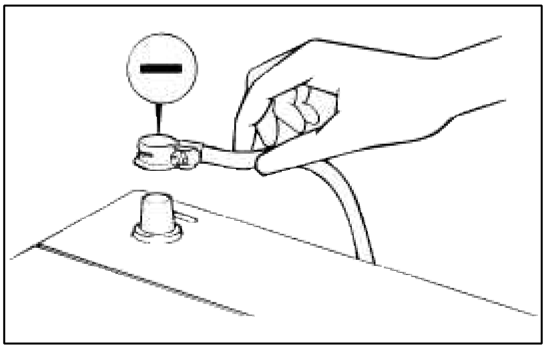
Restraint > Airbag Module > Satellite Sensor > Repair procedures

REMOVAL

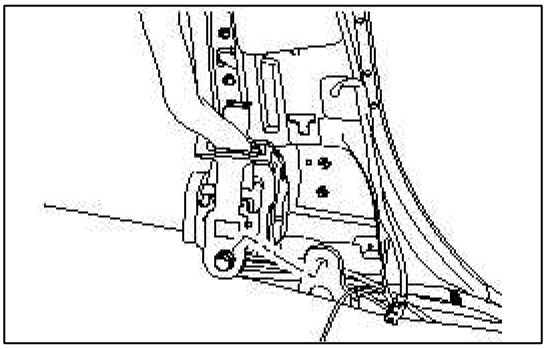
1. Disconnect the negative battery cable and keep secure from battery.

CAUTION

Wait at least 30 seconds after disconnecting the battery cable before doing any further work.

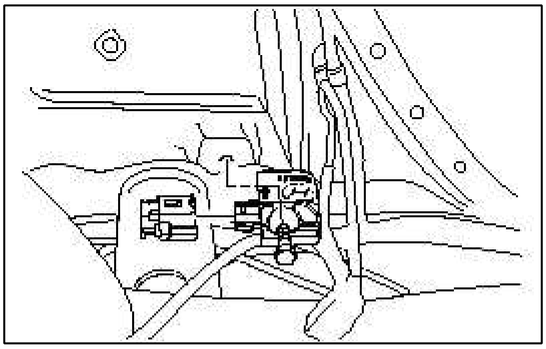


2. Remove the door scuff trim.
3. Remove the lower anchor plate.
4. Remove the center pillar lower trim.
5. Remove the seat belt assembly.



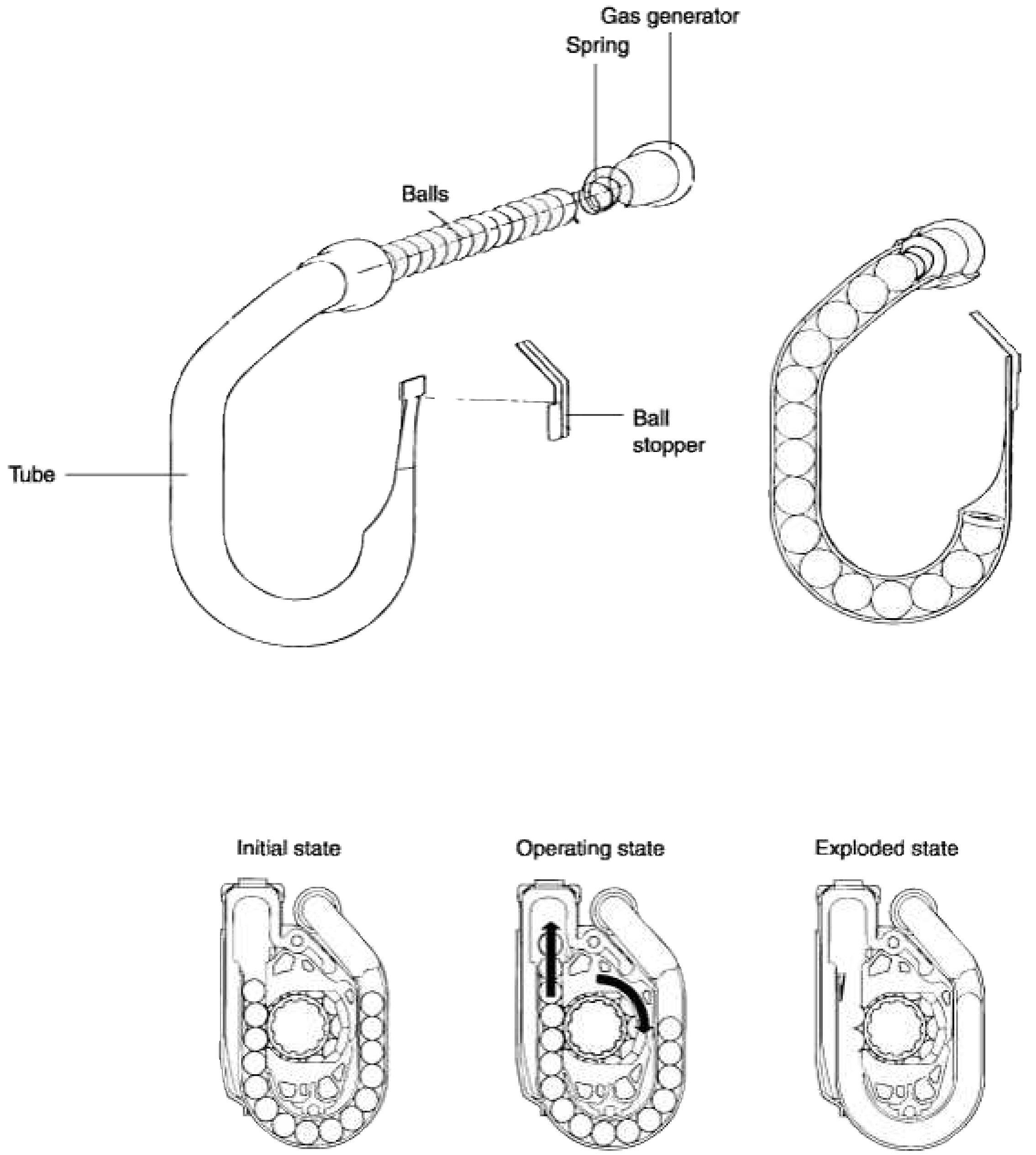
6. Disconnect the satellite sensor connector and remove the satellite sensor.

TORQUE : 8 ~ 10 Nm (80 ~ 100 kg·cm, 6 ~ 7.4 lb·ft)

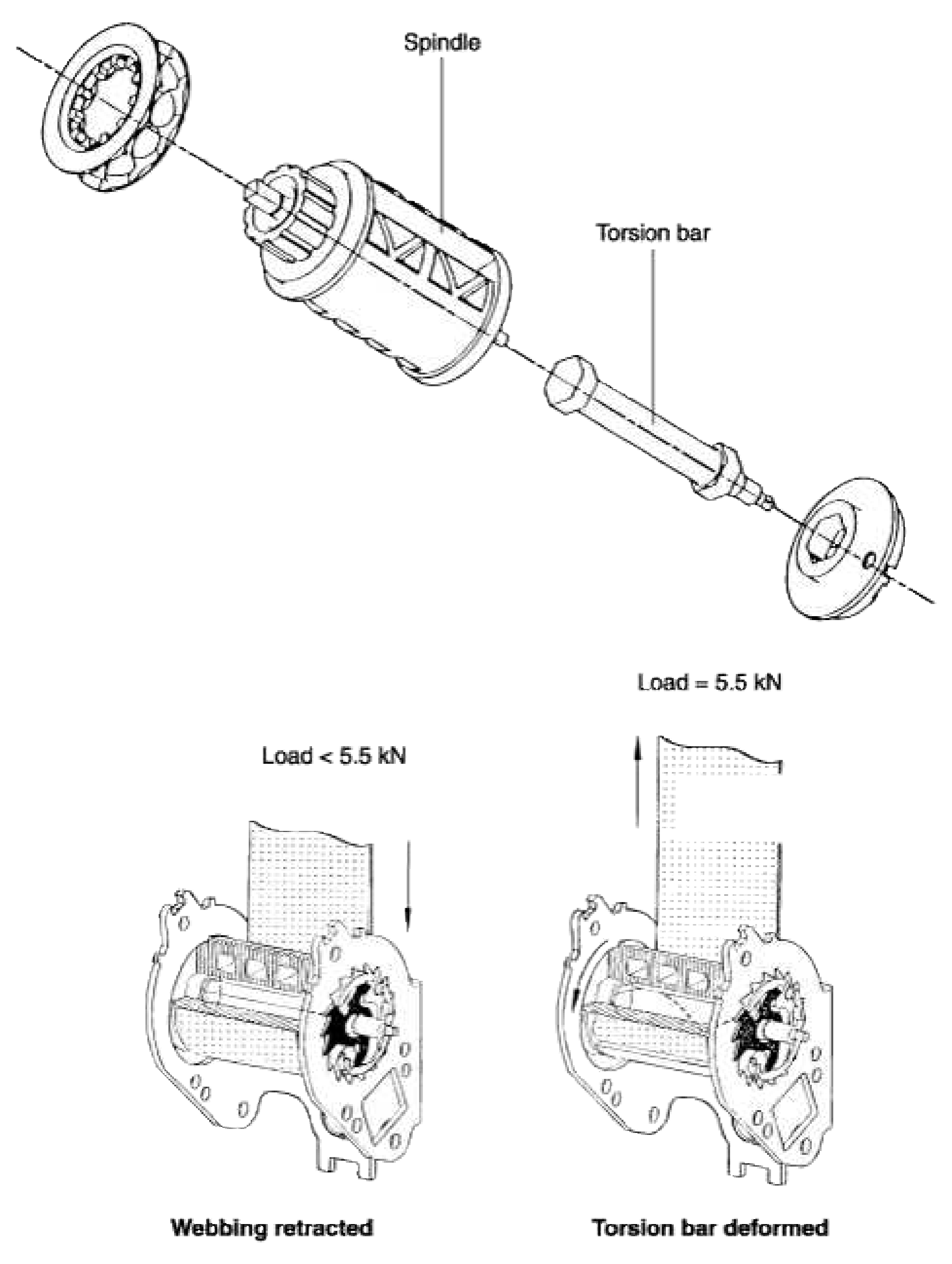


Restraint > Seat Belt Pretensioner > Seat Belt Retractor Pretensioner (BPT) > Description and Operation

FUNCTION OF PRETENSIONER


Gas generator
Spring
Balls
Tube
Ball stopper
Initial state
Operating state
Exploded state

LOAD LIMITER


Spindle
Torsion bar
Load = 5.5 kN
Load < 5.5 kN
Webbing retracted
Torsion bar deformed

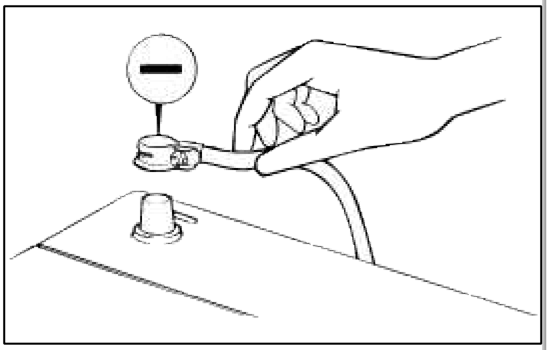
Restraint > Seat Belt Pretensioner > Seat Belt Retractor Pretensioner (BPT) > Repair procedures

REMOVAL

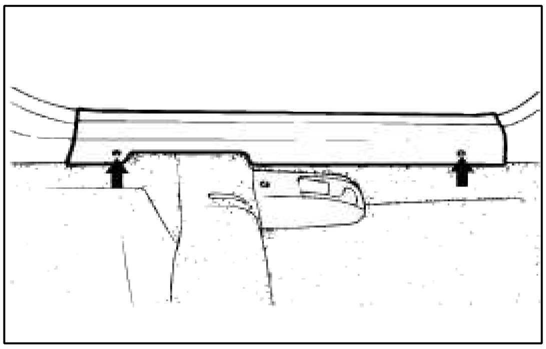
1. Disconnect the battery negative (-) terminal.

WARNING

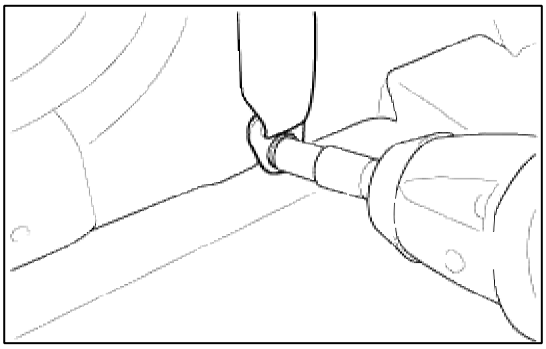
Wait at least 30 seconds.



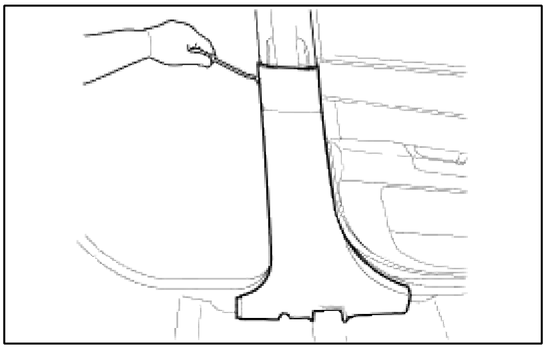
2. Remove the door scuff trim.



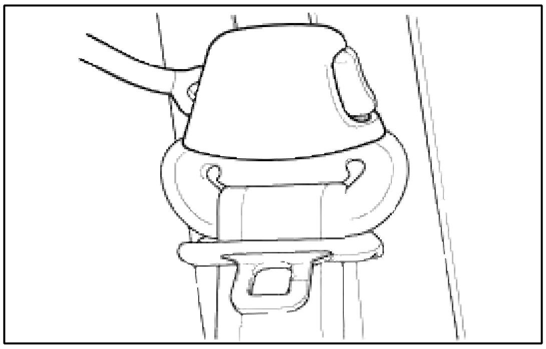
3. Remove the lower anchor plate cover and lower anchor plate.

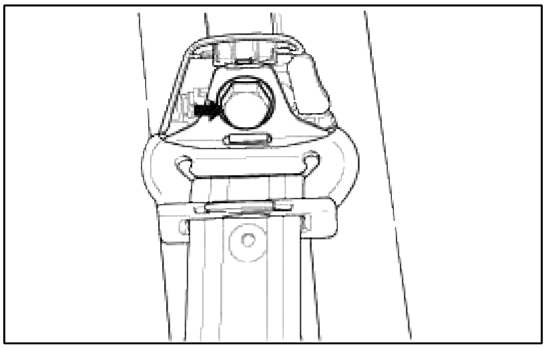


4. Remove the center pillar lower trim.

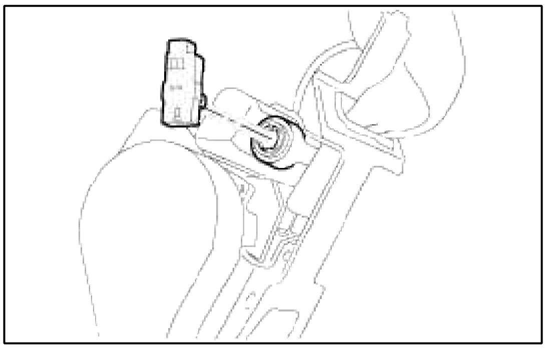


5. Remove the upper anchor plate cover and upper anchor plate.

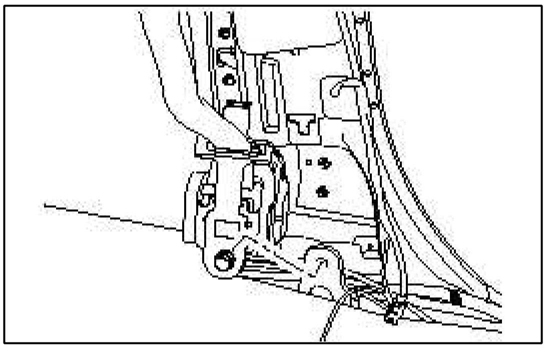




6. Disconnect the belt pretensioner connector.



7. Remove the front seat belt.



WARNING

1. Never attempt to disassemble or repair the BPT.
2. Do not drop the BPT or allow contact with water, grease, oil. Replace it if a dent, crack, deformation or rust are detected.
3. Do not place anything on the BPT.
4. Do not expose the BPT to temperature over 93°C(200°F).
5. BPT functions one time only. Be sure to replace the BPT after it is deployed.
6. Be sure to wear gloves and safety goggles when handling the deployed BPT.

Restraint > Troubleshooting > B1101

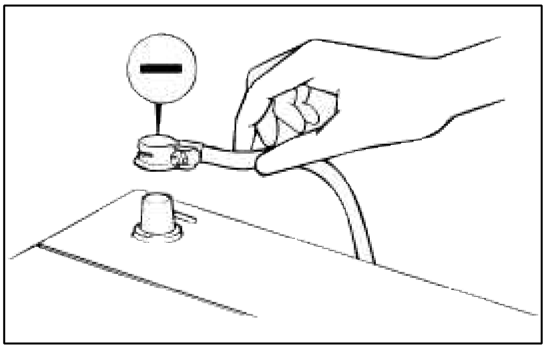
CIRCUIT INSPECTION (DUAL STAGE AIRBAG)

DTC	B1101 Battery voltage too high B1102 Battery voltage too low B1103 Communication voltage too low

CIRCUIT DESCRIPTION

INSPECTION PROCEDURE

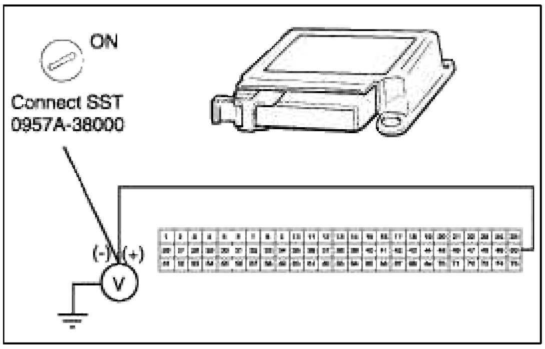
1. Preparation
    (1) Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.
    (2) Remove the DAB module.
    (3) Disconnect the connectors of the PAB, left and right side airbags, belt pretensioners and satellite sensors.
    (4) Disconnect the SRSCM connector.



WARNING

Place the DAB with the front surface facing upward.

2. Check source voltage.
    (1) Connect the negative (-) terminal cable to the battery.
    (2) Turn the ignition switch ON.

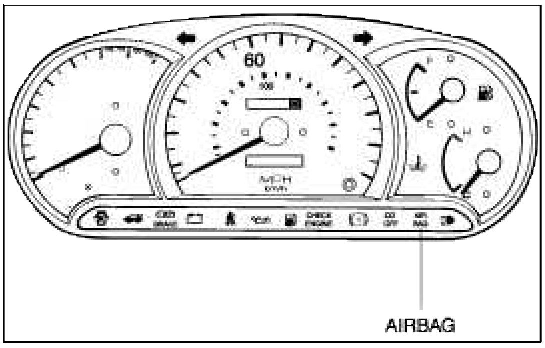


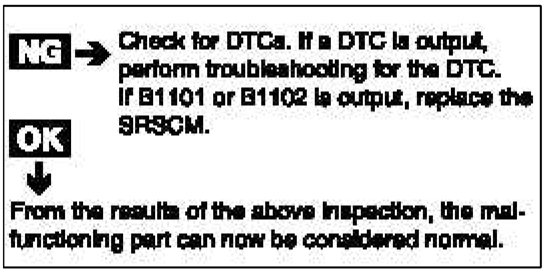
LIMIT : 10-16.5V

NG ➔ Check the harness between the battery and the SRSCM. Check the battery and charging system

OK
↓

1. Does the SRS warning light turn off ?
    (1) Turn the ignition switch to LOCK.
    (2) Connect the DAB module.
    (3) Connect the PAB connector, left and right side airbag, belt pretensioner and satellite connectors.
    (4) Connect the SRSCM connector.
    (5) Turn the ignition switch ON.





NG → Check for DTCs. If a DTC is output, perform troubleshooting for the DTC. If B1101 or B1102 is output, replace the SRSCM.

OK
↓
From the results of the above inspection, the malfunctioning part can now be considered normal.

Restraint > Troubleshooting > B1111

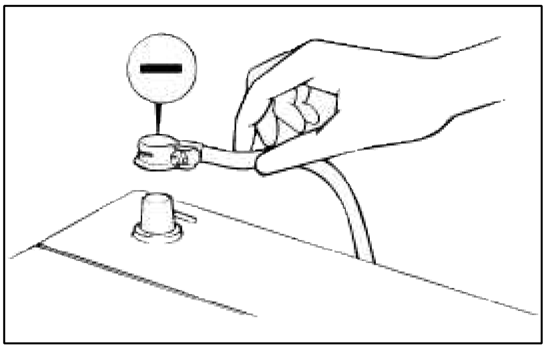
CIRCUIT INSPECTION (SRE-LC)

DTC	B1111 Battery voltage too high B1112 Battery voltage too low

CIRCUIT DESCRIPTION

INSPECTION PROCEDURE

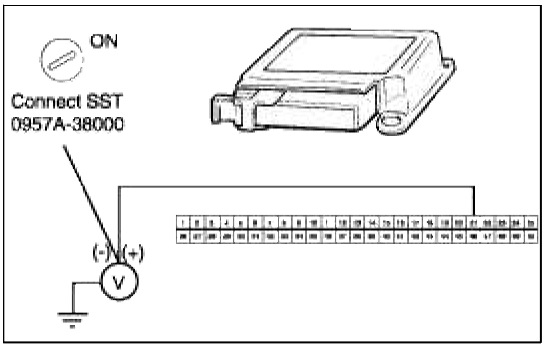
1. Preparation
   (1) Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.
   (2) Remove the DAB module.
   (3) Disconnect the connectors of the PAB, left and right side airbags, belt pretensioners and satellite sensors.
   (4) Disconnect the SRSCM connector.



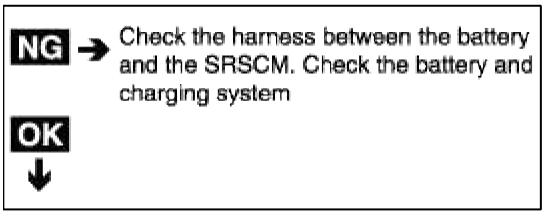
WARNING

Place the DAB with the front surface facing upward.

2. Check source voltage.
   (1) Connect the negative (-) terminal cable to the battery.
   (2) Turn the ignition switch ON.



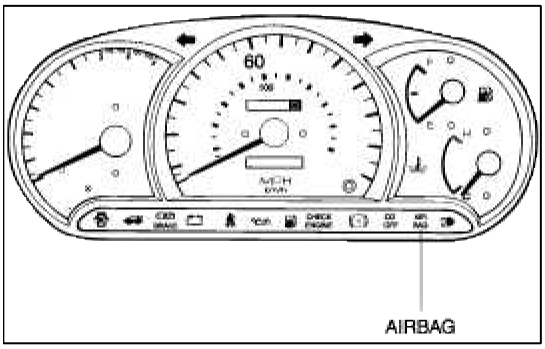
LIMIT : 9-16V

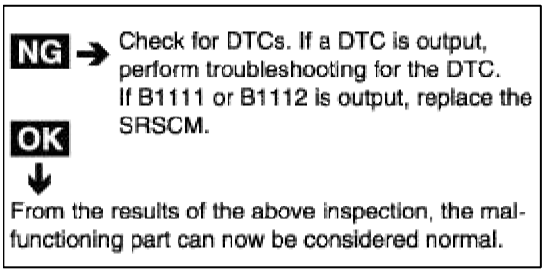

NG ➔ Check the harness between the battery and the SRSCM. Check the battery and charging system

OK

↓

1. Does the SRS warning light turn off ?
   (1) Turn the ignition switch to LOCK.
   (2) Connect the DAB module.
   (3) Connect the PAB connector, left and right side airbag, belt pretensioner and satellite connectors.
   (4) Connect the SRSCM connector.
   (5) Turn the ignition switch ON.




NG ➔ Check for DTCs. If a DTC is output, perform troubleshooting for the DTC. If B1111 or B1112 is output, replace the SRSCM.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

Restraint > Troubleshooting > B1326

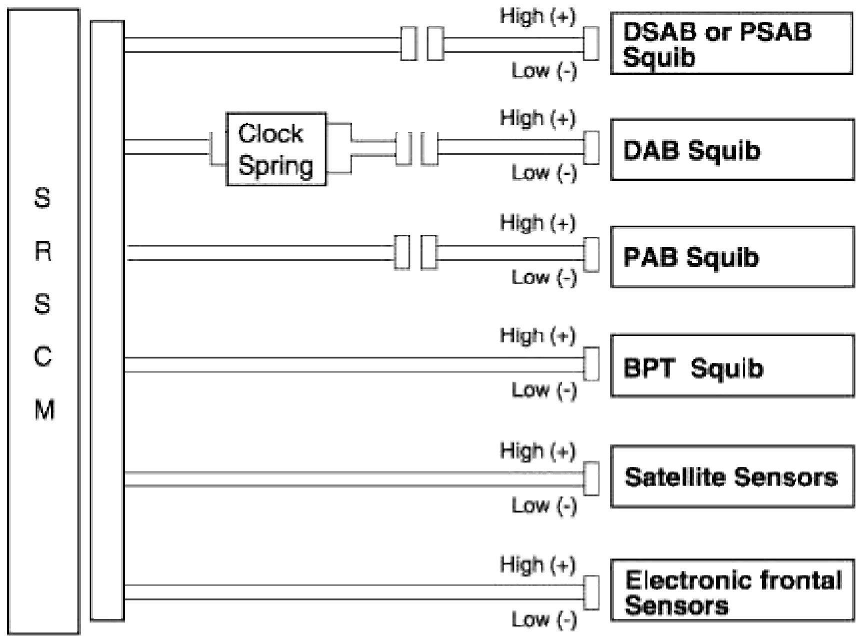
CIRCUIT INSPECTION (DUAL STAGE AIRBAG)

DTC	B1326 Driver side electronic frontal sensor short to ground B1331 Passenger side electronic frontal sensor short to ground B1348 DAB Short to ground B1354 PAB Short to ground B1363 DBPT Short to ground B1369 PBPT Short to ground B1380 DSAB Short to ground B1384 PSAB Short to ground B1401 Satellite sensor left side short to ground B1404 Satellite sensor right side short to ground B1483 2nd stage DAB short to ground B1487 2nd stage PAB short to ground

CIRCUIT DESCRIPTION

DTC Detecting Condition	**Trouble Area**	
• Short circuit in squib wire harness (to ground) • Squib malfunction • Clock spring malfunction • SRSCM malfunction	• DAB squib • PAB squib • DSAB squib • PSAB squib • BPT squib • Satellite sensor • Clock spring • SRSCM • Wire harness	• 2nd stage DAB squib • 2nd stage PAB squib • Electronic frontal sensor

WIRING DIAGRAM


S R S C M
Clock Spring
High (+)
Low (-)
DSAB or PSAB Squib
DAB Squib
PAB Squib
BPT Squib
Satellite Sensors
Electronic frontal Sensors

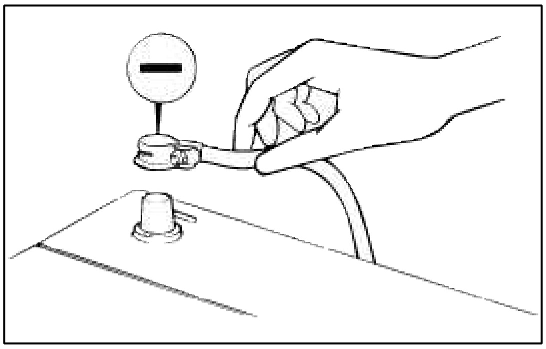
INSPECTION PROCEDURE

1. Preparation
   (1) Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.

   (2) Remove the DAB module.

   (3) Disconnect the connectors of the PAB, left and right side airbags, belt pretensioners and satellite sensors.

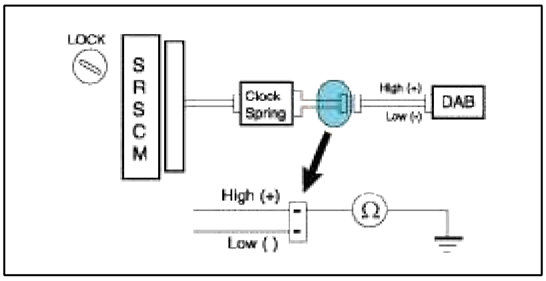
   (4) Disconnect the SRSCM connector.



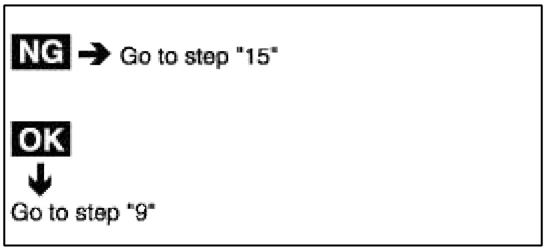
WARNING

Place the DAB with the front surface facing upward.

2. Check the DAB squib circuit.



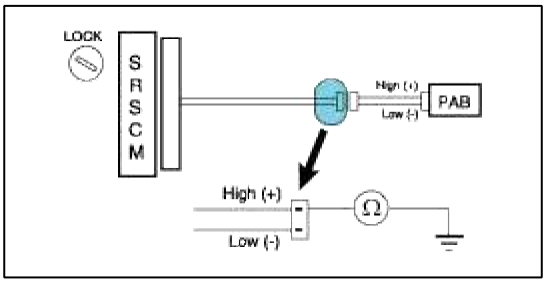
[CHECK]
For the connector (on the clock spring side) between the clock spring and the DAB, measure the resistance between the DAB high and body ground.
Resistance: ∞



NG → Go to step "15"

OK
↓
Go to step "9"

3. Check the PAB squib circuit.


LOCK
SRSCM
High (+)
Low (-)
PAB
High (+)
Low (-)
Ω

[CHECK]

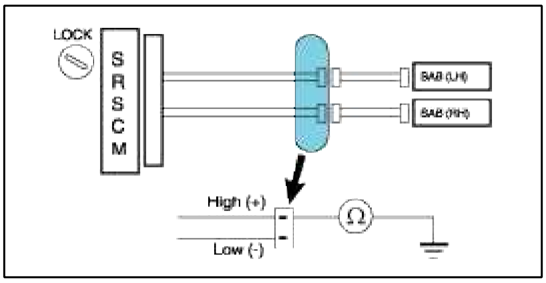
For the connector (on the SRSCM side) between the SRSCM and the PAB, measure the resistance between the PAB high and body ground.

Resistance: ∞

NG ➔ Repair or replace the harness or the connector between the SRSCM and the PAB.

OK
↓
Go to step "10"

4. Check the PSAB and DSAB squib circuit.


LOCK
SRSCM
SAB (LH)
SAB (RH)
High (+)
Low (-)
Ω

[CHECK]

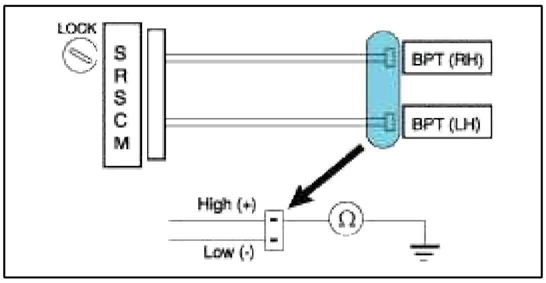
For the connector (on the SRSCM side) between the SRSCM and the SAB, measure the resistance between the SAB high and body ground.

Resistance: ∞

NG ➔ Repair or replace the harness between the SRSCM and the SAB.

OK
↓
Go to step "11"

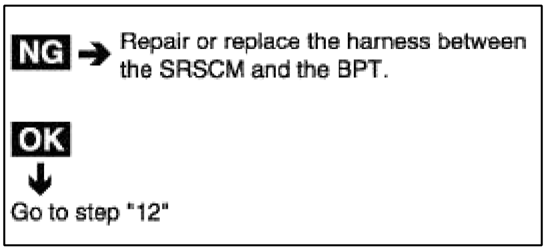
5. Check the BPT squib circuit.


LOCK
SRSCM
BPT (RH)
BPT (LH)
High (+)
Low (-)
Ω

[CHECK]

For the connector (on the SRSCM side) between the SRSCM and the BPT, measure the resistance between the BPT high and body ground.

Resistance: ∞



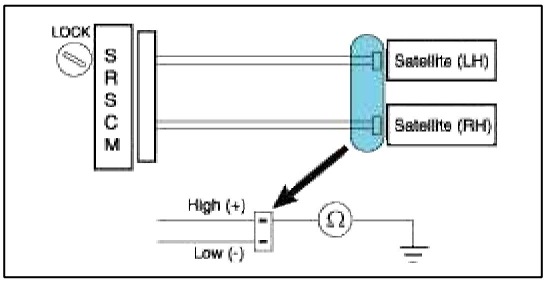
NG ➔ Repair or replace the harness between the SRSCM and the BPT.

OK

↓

Go to step "12"

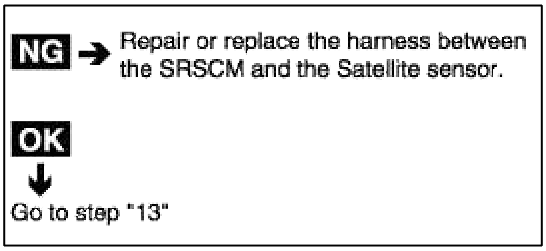
6. Check the Satellite sensor circuit.


LOCK
SRSCM
Satellite (LH)
Satellite (RH)
High (+)
Low (-)
Ω

[CHECK]

For the connector (on the SRSCM side) between the SRSCM and the Satellite sensor, measure the resistance between the Satellite high and body ground.

Resistance: ∞



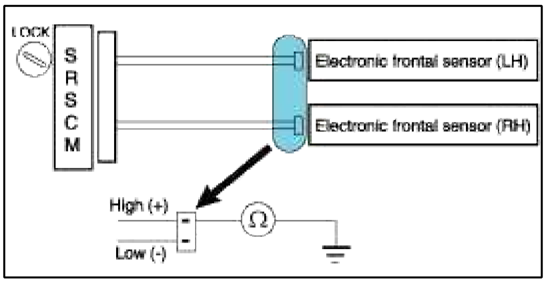
NG ➔ Repair or replace the harness between the SRSCM and the Satellite sensor.

OK

↓

Go to step "13"

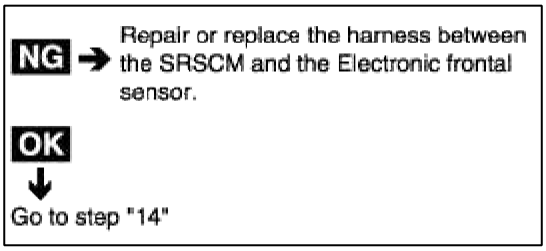
7. Check the electronic frontal sensor circuit.


LOCK
SRSCM
Electronic frontal sensor (LH)
Electronic frontal sensor (RH)
High (+)
Low (-)
Ω

[CHECK]

For the connector (on the SRSCM side) between the SRSCM and the Electronic frontal sensor, measure the resistance between the Electronic frontal sensor high and body ground.

Resistance: ∞



NG ➔ Repair or replace the harness between the SRSCM and the Electronic frontal sensor.

OK

↓

Go to step "14"

8. Check the SRSCM.

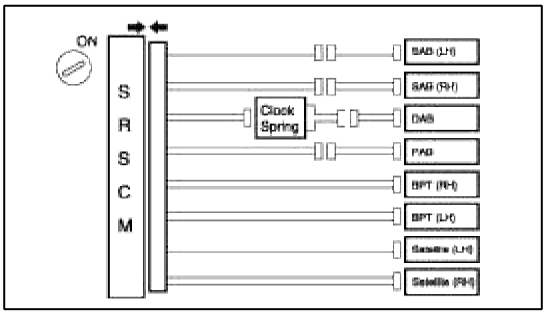
A. Connect the connector to the SRSCM.

B. Using a service wire, connect the DAB high and the DAB low to the clock spring side connector between the clock spring and the DAB.

C. Using a service wire, connect the PAB high and low on the SRSCM side of the connector between the SRSCM and the PAB.

D. Connect the SAB and the BPT by the same method.

E. Connect the negative (-) terminal cable to the battery, and wait least 30 seconds.


ON
SRSCM
Clock Spring
SAB (LH)
SAB (RH)
DAB
PAB
BPT (RH)
BPT (LH)
Satellite (LH)
Satellite (RH)

A. Turn the ignition switch to ON, and wait at least 30 seconds.

B. Clear the malfunction code stored in the memory with the Hi-Scan Pro.

C. Turn the ignition switch to LOCK, and wait for 30 seconds.

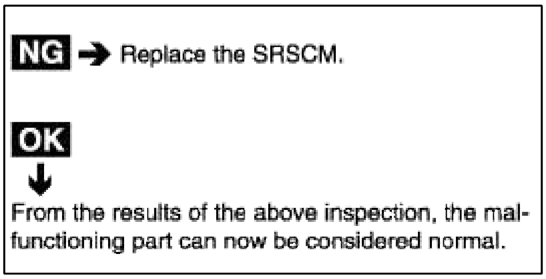
D. Turn the ignition switch to ON, and wait for 30 seconds.

E. Using Hi-Sacn Pro, check the DTC.

There is no DTC.

[HINT]

Codes other than these ones may be output at this time, but they are not relevant to this check.



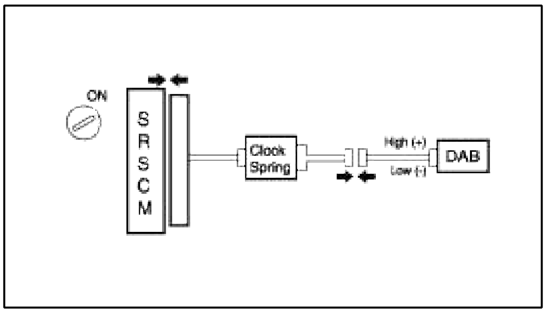
NG ➔ Replace the SRSCM.

OK

↓

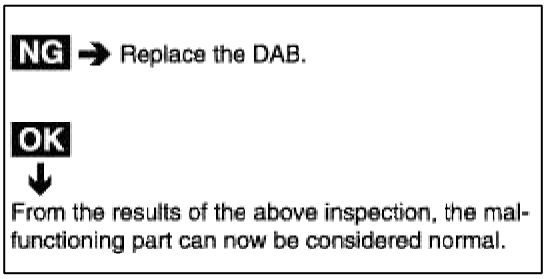
From the results of the above inspection, the malfunctioning part can now be considered normal.

9. Check the DAB squib.
   A. Turn the ignition switch to LOCK.
   B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
   C. Connect the the DAB connector.
   D. Connect the negative (-) terminal cable to the battery, and wait for 30 seconds.



   A. Turn the ignition switch to ON, and wait for at least 30 seconds.
   B. Clear the malfunction code stored in the memory with the Hi-Scan Pro.
   C. Turn the ignition switch to LOCK, and wait for 30 seconds.
   D. Turn the ignition switch to ON, and wait for 30 seconds.
   E. Using the Hi-scan, check the DTC.

   There is no DTC.



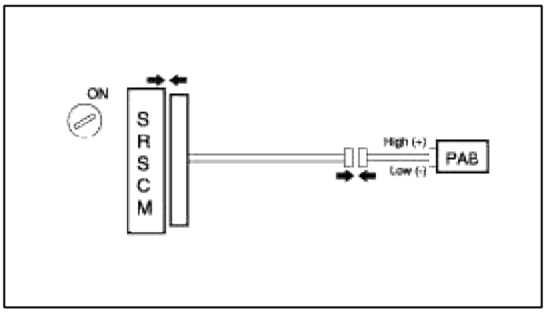
NG → Replace the DAB.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

10. Check the PAB squib.
    A. Turn the ignition switch to LOCK.
    B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
    C. Connect the the PAB connector.
    D. Connect the negative (-) terminal cable from the battery, and wait for 30 seconds.

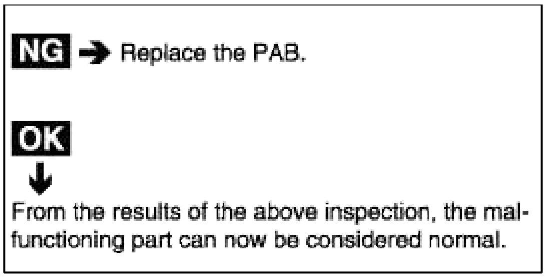


    A. Turn the ignition switch to ON, and wait for at least 30 seconds.
    B. Clear the malfunction code stored in the memory with Hi-Scan Pro.
    C. Turn the ignition switch to LOCK, and wait for 30 seconds.
    D. Turn the ignition switch to ON, and wait for 30 seconds.
    E. Using the Hi-Sacn Pro, check the DTC.

    There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.



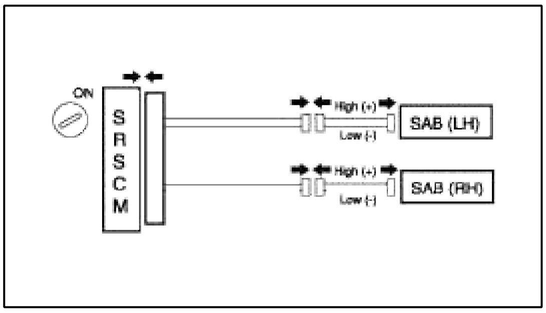
NG ➔ Replace the PAB.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

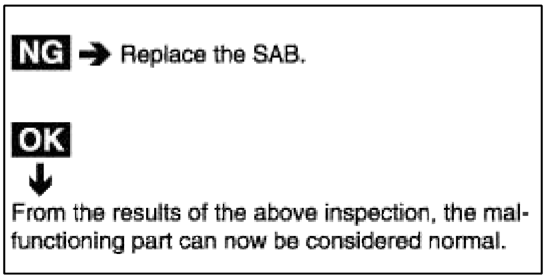
11. Check the SAB squib.
    A. Turn the ignition switch to LOCK.
    B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
    C. Connect the the SAB connector.
    D. Connect the negative (-) terminal cable from the battery, and wait for 30 seconds.



A. Turn the ignition switch to ON, and wait for at least 30 seconds.
B. Clear the malfunction code stored in the memory with the Hi-Scan Pro.
C. Turn the ignition switch to LOCK, and wait for 30 seconds.
D. Turn the ignition switch ON, and wait for 30 seconds.
E. Using the Hi-Sacn Pro, check the DTC.
There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.



NG ➔ Replace the SAB.

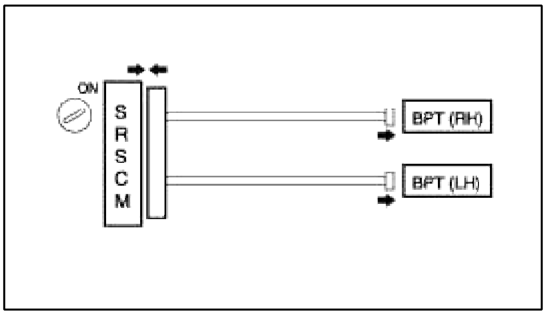
OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

12. Check the BPT squib.

  A. Turn the ignition swich to LOCK.
  B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
  C. Connect the BPT connector.
  D. Connect the negative (-) terminal cable from the battery, and wait for 30 seconds.

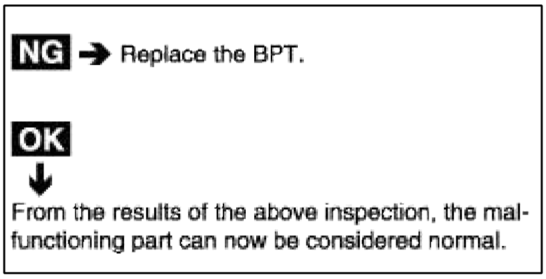


  A. Turn the ignition switch to ON, and wait for 30 seconds.
  B. Clear the malfunction code stored in the memory with the Hi-Scan Pro.
  C. Turn the ignition switch to LOCK, and wait for 30 seconds.
  D. Turn the ignition switch to ON, and wait for 30 seconds.
  E. Using the Hi-Scan Pro, check the DTC.

There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.



NG → Replace the BPT.

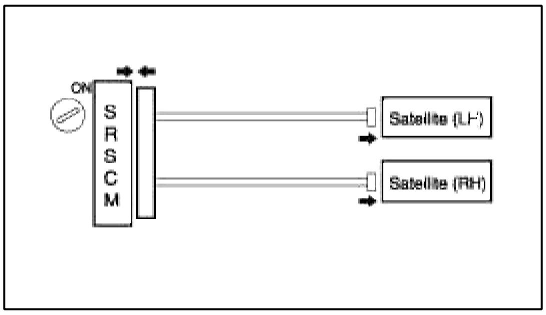
OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

13. Check the Satellite sensors.

  A. Turn ignition switch to LOCK.
  B. Disconnect negative (-) terminal cable from the battery, and wait at least 30 seconds.
  C. Connect the Satellite sensor connector.
  D. Connect the negative (-) terminal cable from the battery, and wait at least 30 seconds.

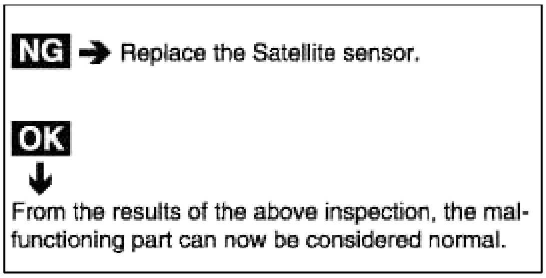


  A. Turn the ignition switch to ON, and wait at least 30 seconds.
  B. Clear the malfunction code stored in memory with the Hi-Scan Pro.
  C. Turn the ignition switch to LOCK, and wait at least 30 seconds.
  D. Turn the ignition switch to ON, and wait at least 30 seconds.
  E. Using the Hi-Scan Pro, check for DTCs.

There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.



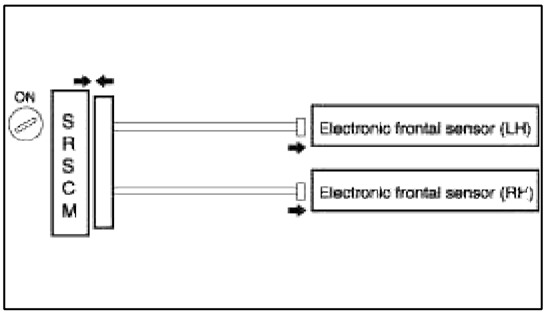
NG ➔ Replace the Satellite sensor.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

14. Check the electronic frontal sensors.
    - A. Turn the ignition switch to LOCK.
    - B. Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.
    - C. Connect the electronic frontal sensor connector.
    - D. Commect the negative (-) terminal cable from the battery, and wait at least 30 seconds.


ON
SRSCM
Electronic frontal sensor (LH)
Electronic frontal sensor (RH)

A. Turn the ignition switch to ON, and wait at least 30 seconds.

B. Clear the malfunction code stored in memory with the Hi-Scan Pro.

C. Turn the ignition switch to LOCK, and wait at least 30 seconds.

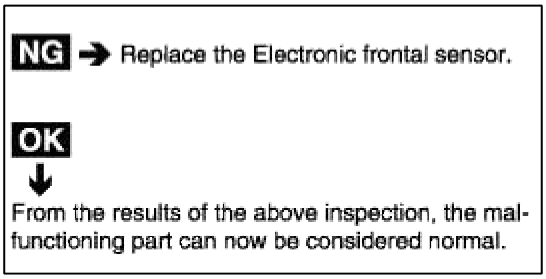
D. Turn the ignition switch to ON, and wait at least 30 seconds.

E. Using the Hi-Scan Pro, check for DTCs.

There is noDTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.



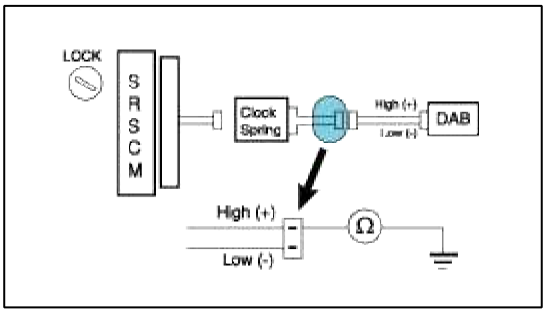
NG ➔ Replace the Electronic frontal sensor.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

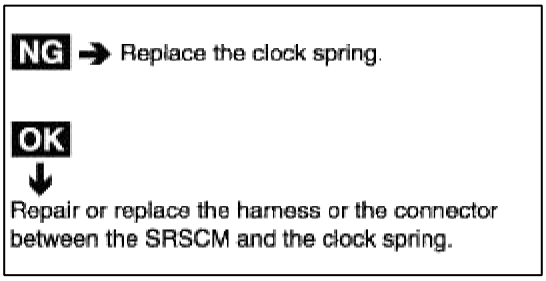
15. Check the clock spring circuit.



[CHECK]

Measure the resistance between the DAB high on the clock spring side of the connector between the clock spring and the DAB and body ground.

Resistance: ∞



NG → Replace the clock spring.

OK ↓

Repair or replace the harness or the connector between the SRSCM and the clock spring.

Restraint > Troubleshooting > B1327

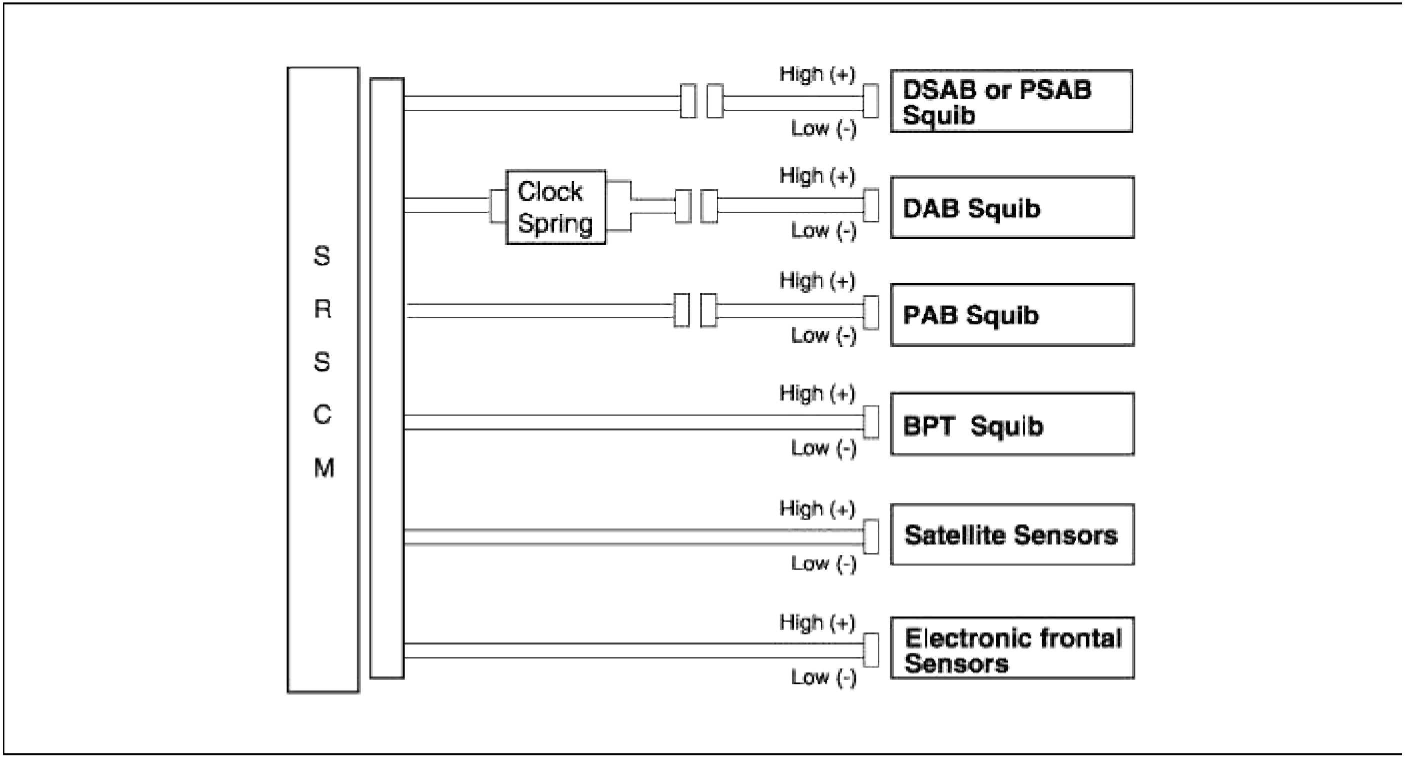
CIRCUIT INSPECTION (DUAL STAGE AIRBAG)

DTC	B1327 Driver side electronic frontal sensor short to battery B1332 Passenger side electronic frontal sensor short to battery B1349 DAB Short to battery B1355 PAB Short to battery B1364 BPT (Driver) Short to battery B1370 BPT (Passenger) Short to battery B1381 SAB (Driver) short to battery B1385 SAB (Passenger) short to battery B1402 Satellite left side short to battery B1405 Satellite right side short to battery B1484 2nd stage DAB shrot to battery B1488 2nd stage PAB short to battery

CIRCUIT DESCRIPTION

DTC Detecting Condition	Trouble Area	
• Short circuit in squib wire harness (to B+) • Squib malfunction • Spiral cable malfunction • SRSCM malfunction	• DAB squib • PAB squib • DSAB or PSAB squib • BPT squib • Satellite sensor • Wire harness	• 2nd stage DAB squib • 2nd stage PAB squib • Electronic frontal sensor

WIRING DIAGRAM


S
R
S
C
M
Clock Spring
High (+)
Low (-)
DSAB or PSAB Squib
DAB Squib
PAB Squib
BPT Squib
Satellite Sensors
Electronic frontal Sensors

INSPECTION PROCEDURE

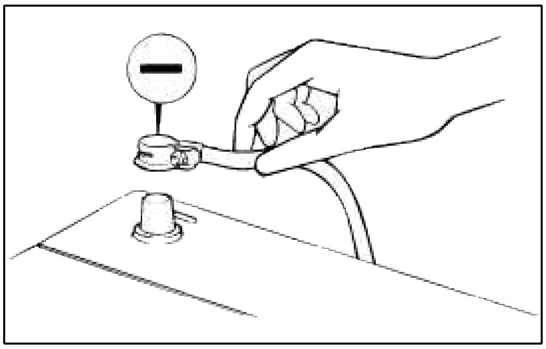
1. Preparation

(1) Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.

(2) Remove the DAB module.

(3) Disconnect the connectors of the PAB, left and right side airbags, belt pretensioners and satellite sensors.

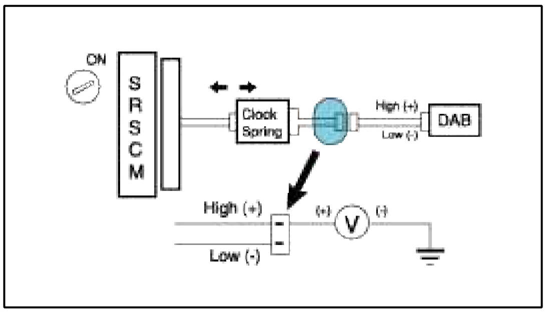
(4) Disconnect the SRSCM connector.



WARNING

Place the DAB with the front surface facing upward.

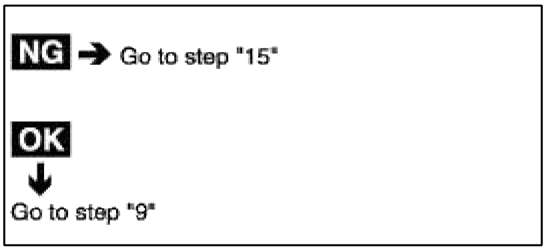
2. Check the DAB squib circuit.


ON
SRSCM
Clock Spring
High (+)
Low (-)
DAB
High (+)
(+)
V
(-)
Low (-)

[CHECK]

For the connector (on the clock spring side) between the clock spring and the DAB, measure the voltage between the DAB high and body ground.

Voltage : 0 V



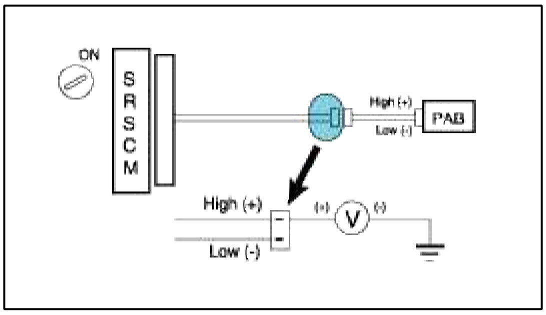
NG ➔ Go to step "15"

OK

↓

Go to step "9"

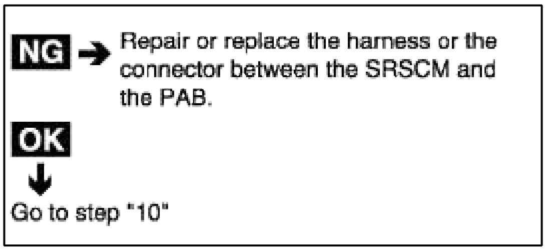
3. Check the PAB squib circuit.


ON
SRSCM
High (+)
Low (-)
PAB
High (+)
(+)
V
(-)
Low (-)

[CHECK]

For the connector (on the SRSCM side) between the SRSCM and the PAB, measure the voltage between the PAB high and body ground.

Voltage : 0 V



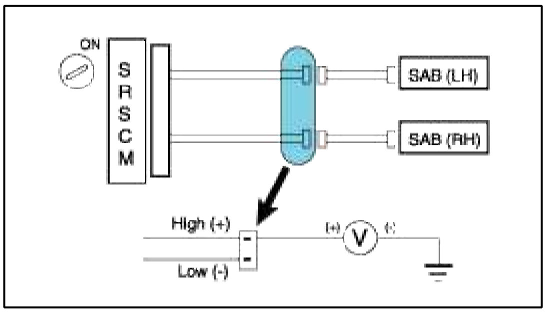
NG ➔ Repair or replace the harness or the connector between the SRSCM and the PAB.

OK

↓

Go to step "10"

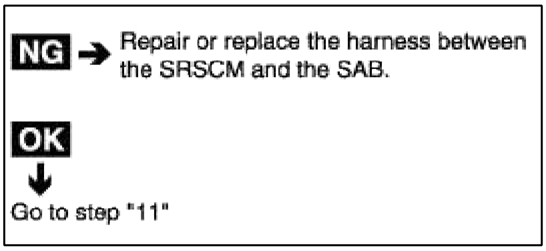
4. Check the SAB squib circuit.


ON
SRSCM
SAB (LH)
SAB (RH)
High (+)
Low (-)
(+)
V
(-)

[CHECK]

For the connector (on the SRSCM side) between the SRSCM and the SAB, measure the voltage between the SAB high and body ground.

Voltage : 0 V



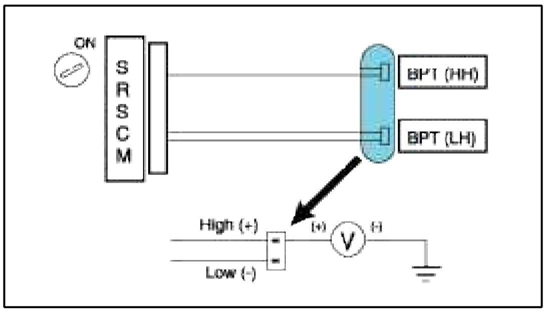
NG ➔ Repair or replace the harness between the SRSCM and the SAB.

OK

↓

Go to step "11"

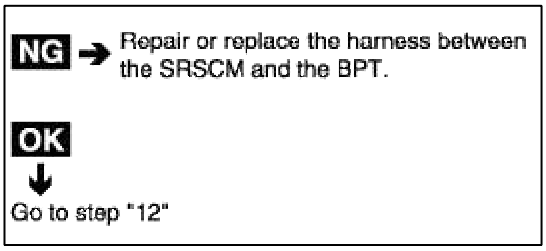
5. Check the BPT squib circuit.


ON
SRSCM
BPT (RH)
BPT (LH)
High (+)
Low (-)
(+)
V
(-)

[CHECK]

For the connector between the SRSCM and the BPT, measure the voltage between the BPT high and body ground.

Voltage : 0 V



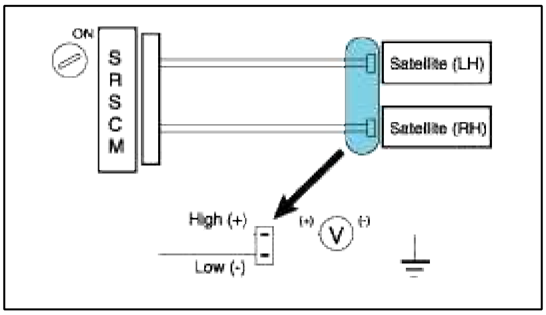
NG ➔ Repair or replace the harness between the SRSCM and the BPT.

OK

↓

Go to step "12"

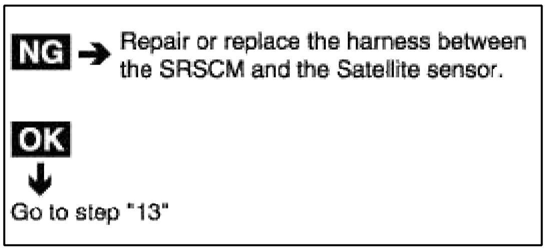
6. Check the Satellite sensor circuit.


ON
SRSCM
Satellite (LH)
Satellite (RH)
High (+)
Low (-)
(+)
V
(-)

[CHECK]

For the connector between the SRSCM and the Satellite sensor, measure the voltage between the Satellite sensor high and body ground.

Voltage : 0 V



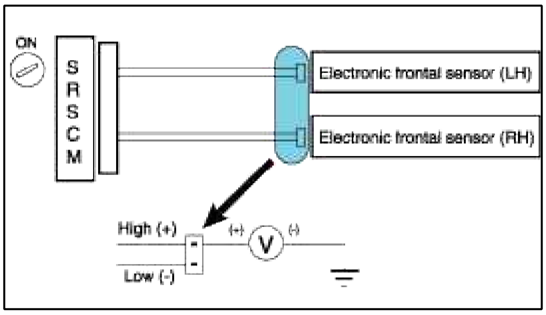
NG ➔ Repair or replace the harness between the SRSCM and the Satellite sensor.

OK

↓

Go to step "13"

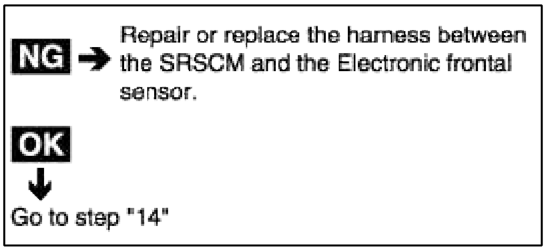
7. Check the electronic frontal sensor circuit.


ON
SRSCM
Electronic frontal sensor (LH)
Electronic frontal sensor (RH)
High (+)
Low (-)
(+)
V
(-)

[CHECK]

For the connector between the SRSCM and the electronic frontal sensor, measure the voltage between the electronic frontal sensor high and body ground.

Voltage : 0 V



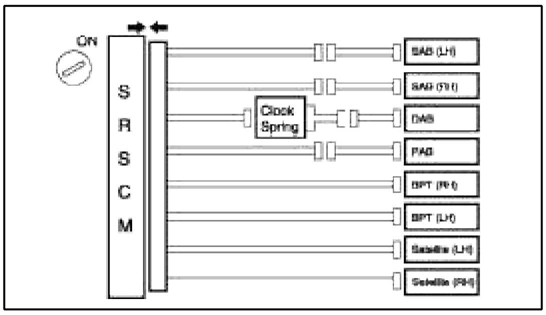
NG ➔ Repair or replace the harness between the SRSCM and the Electronic frontal sensor.

OK

↓

Go to step "14"

8. Check the SRSCM.



A. Connect the connector to the SRSCM.

B. Using a service wire, connect the DAB high and low on the clock spring side of the connector between the clock spring and the DAB.

C. Using a service wire, connect the PAB high and low on the SRSCM side of the connector between the SRSCM and the PAB.

D. Using a service wire, connect the SAB high and low on the SRSCM side connector between the SRSCM and the SAB.

E. Using a service wire, connect the BPT high and low on the SRSCM side connector between the SRSCM and the BPT.

F. Using a service wire, connect the satellite high and low on the SRSCM side connector between the SRSCM and the satellite sensor.

G. Connect negative (-) battery cable to the battery, and wait at least 30 seconds.

A. Turn the ignition switch to ON, and wait at least 30 seconds.

B. Clear the malfunction code stored in memory with Hi-Scan Pro.

C. Turn the ignition switch to LOCK, and wait at least 30 seconds.

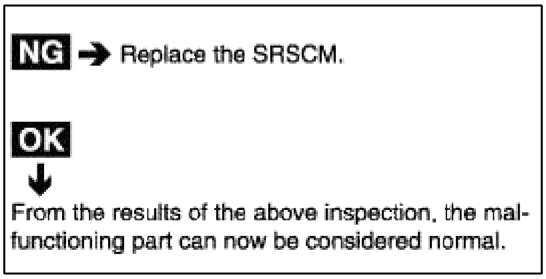
D. Turn the ignition switch to ON, and wait at least 30 seconds.

E. Using Hi-Scan Pro, check the DTC.

There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this check.



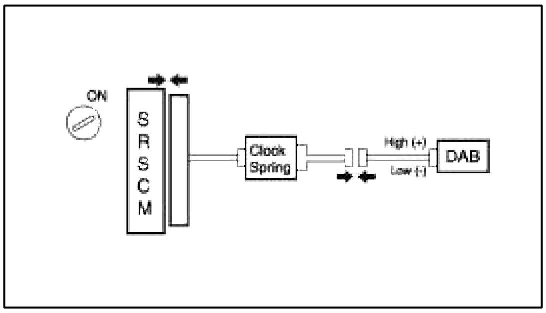
NG → Replace the SRSCM.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

9. Check the DAB squib.
    A. Turn the ignition switch to LOCK.
    B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
    C. Connect the DAB connector.
    D. Connect the negative (-) terminal cable to the battery, and wait for 30 seconds.

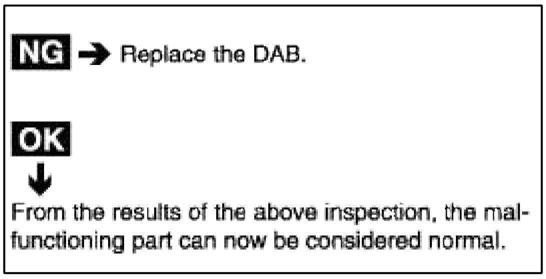


A. Turn the ignition switch to ON, and wait for at least 30 seconds.
B. Clear the malfunction code stored in the memory with the Hi-Scan Pro.
C. Turn the ignition switch to LOCK, and wait for 30 seconds.
D. Turn the ignition switch to ON, and wait for 30 seconds.
E. Using Hi-Scan Pro, check the DTC.

There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.



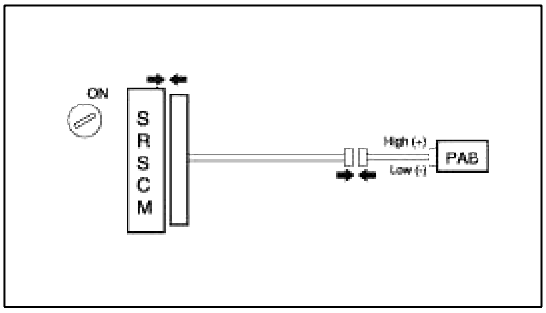
NG → Replace the DAB.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

10. Check the PAB squib.
    A. Turn the ignition switch to LOCK.
    B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
    C. Connect the the PAB connector.
    D. Connect the negative (-) terminal cable from the battery, and wait for 30 seconds.

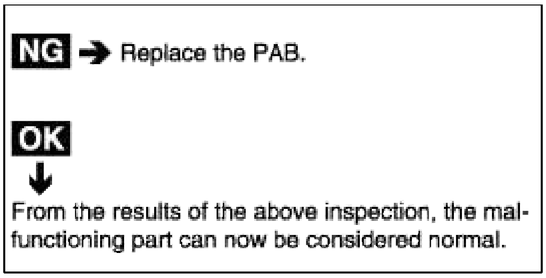


A. Turn the ignition switch to ON, and wait for at least 30 seconds.
B. Clear the malfunction code stored in the memory with Hi-Scan Pro.
C. Turn the ignition switch to LOCK, and wait for 30 seconds.
D. Turn the ignition switch ON, and wait for 30 seconds.
E. Using the Hi-Sacn Pro, check the DTC.

There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.



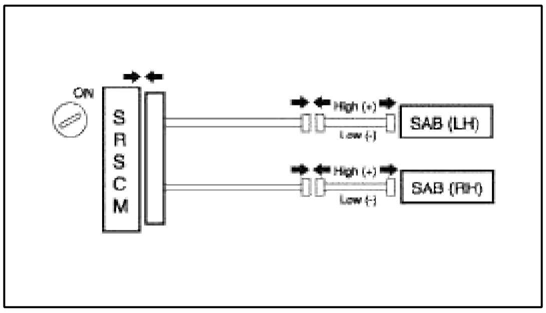
NG → Replace the PAB.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

11. Check the SAB squib.
    - A. Turn the ignition switch to LOCK.
    - B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
    - C. Connect the SAB connector.
    - D. Connect the negative (-) terminal cable from the battery, and wait for 30 seconds.

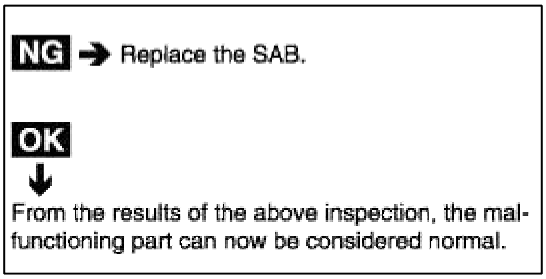


- A. Turn the ignition switch to ON, and wait for at least 30 seconds.
- B. Clear the malfunction code stored in the memory with Hi-Scan Pro.
- C. Turn the ignition switch to LOCK, and wait for 30 seconds.
- D. Turn the ignition switch ON, and wait for 30 seconds.
- E. Using the Hi-Sacn Pro, check the DTC.

  There is no DTC.

[HINT]

Codes other than these ones may be output at this time, but they are not relevant to this checking procedure.



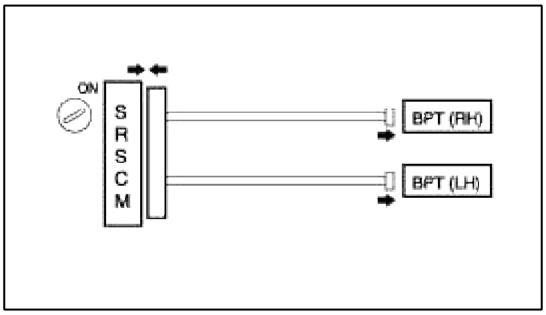
NG → Replace the SAB.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

12. Check the BPT squib.
    A. Turn the ignition swich to LOCK.
    B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
    C. Connect the the BPT connector.
    D. Connect the negative (-) terminal cable from the battery, and wait for 30 seconds.

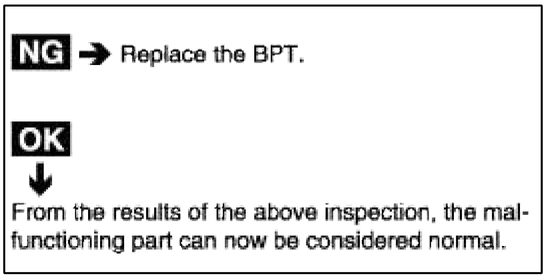


    A. Turn the ignition switch to ON, and wait for 30 seconds.
    B. Clear the malfunction code stored in the memory with the Hi-Scan Pro.
    C. Turn the ignition switch to LOCK, and wait for 30 seconds.
    D. Turn the ignition switch to ON, and wait for 30 seconds.
    E. Using the Hi-Scan Pro check the DTC.

There is no DTC.

[HINT]

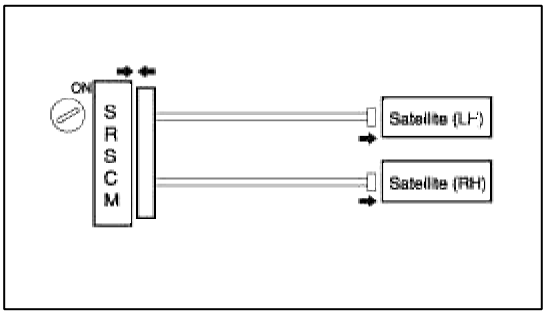
Codes other than these may be output at this time, but they are not relevant to this procedure.



NG → Replace the BPT.

OK
↓
From the results of the above inspection, the malfunctioning part can now be considered normal.

13. Check the Satellite sensors.
    A. Turn ignition switch to LOCK.
    B. Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.
    C. Connect the Satellite sensor connector.
    D. Connect the negative (-) terminal cable from the battery, and wait at least 30 seconds.

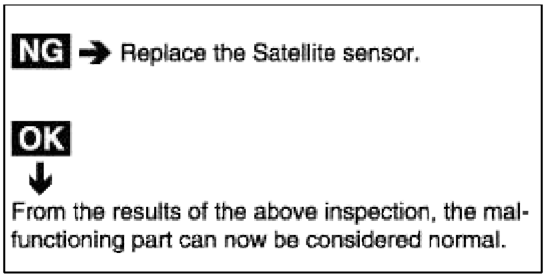


    A. Turn the ignition switch to ON, and wait at least 30 seconds.
    B. Clear the malfunction code stored in memory with Hi-scan Pro.
    C. Turn the ignition switch to LOCK, and wait at least 30 seconds.
    D. Turn the ignition switch to ON, and wait at least 30 seconds.
    E. Using the Hi-Scan Pro, check for DTCs.

There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.



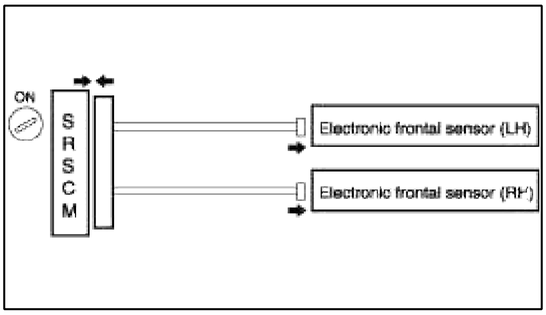
NG → Replace the Satellite sensor.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

14. Check the electronic frontal sensors.
    - A. Turn ignition switch to LOCK.
    - B. Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.
    - C. Connect the Electronic frontal sensor connector
    - D. Connect the negative (-) terminal cable from the battery, and wait at least 30 seconds.

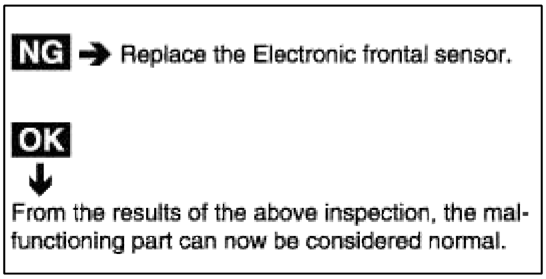

ON
SRSCM
Electronic frontal sensor (LH)
Electronic frontal sensor (RH)

- A. Turn the ignition switch to ON, and wait at least 30 seconds.
- B. Clear the malfunction code stored in memory with Hi-scan.
- C. Turn the ignition switch to LOCK, and wait at least 30 seconds.
- D. Turn the ignition switch to ON, and wait at least 30 seconds.
- E. Using the Hi-Scan Pro, check for DTCs.

  There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure



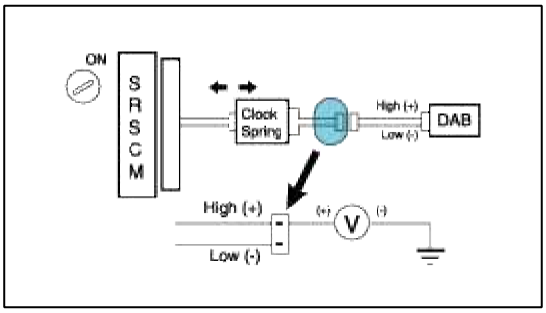
NG → Replace the Electronic frontal sensor.

OK

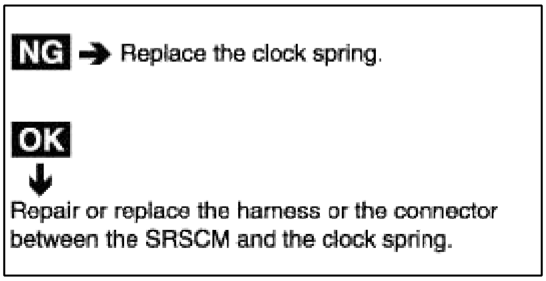
↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

15. Check the clock spring.
    A. Turn the ignition switch to LOCK.
    B. Disconnect the connector between the SRSCM and the clock spring.



[CHECK]
Turn the ignition switch to ON, and measure voltage between the DAB high and body ground.
Voltage : 0 V



NG → Replace the clock spring.

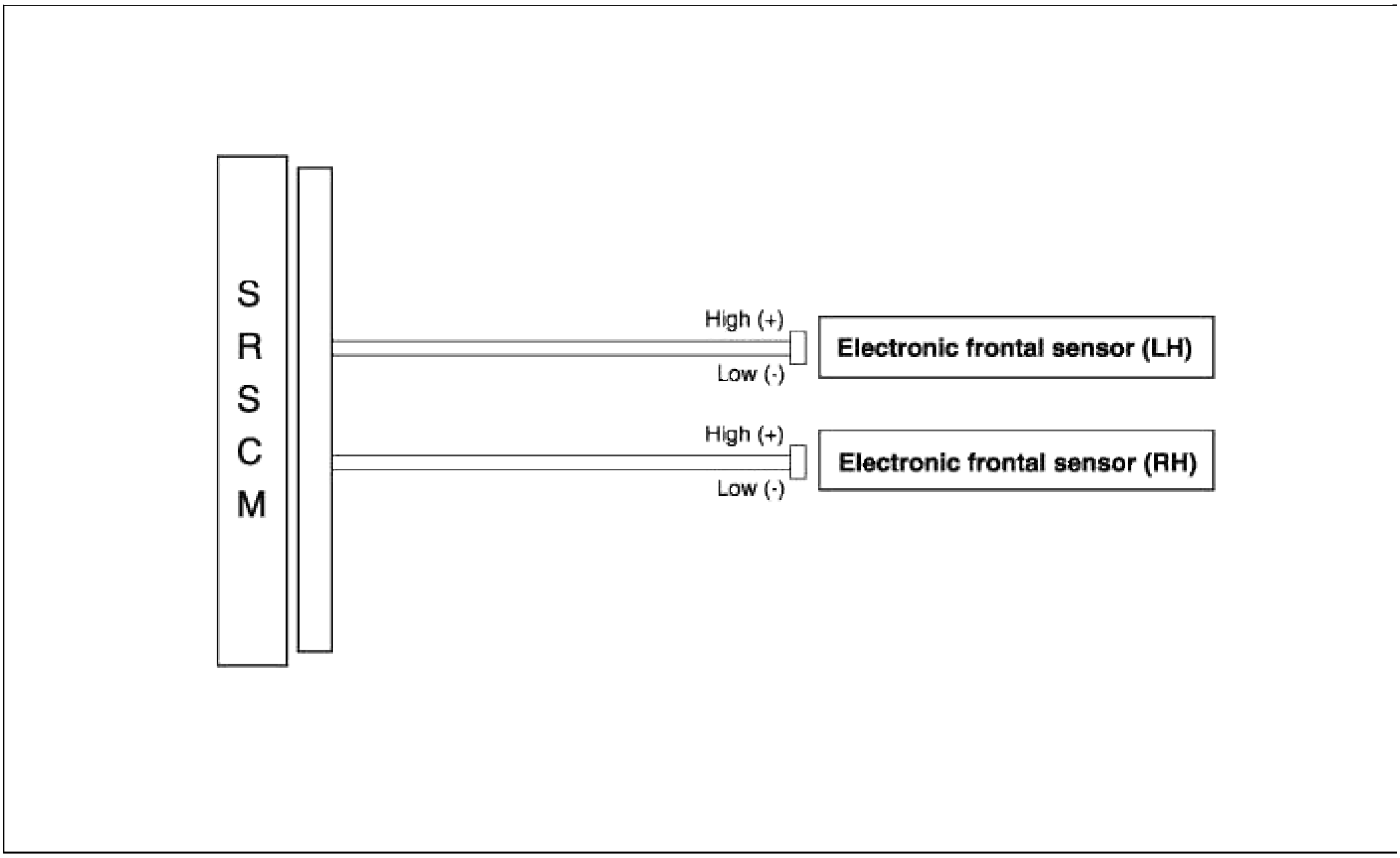
OK
↓
Repair or replace the harness or the connector between the SRSCM and the clock spring.

Restraint > Troubleshooting > B1328

CIRCUIT INSPECTION (DUAL STAGE AIRBAG)

DTC	B1328 Electronic frontal sensor left side defect B1329 Electronic frontal sensor left communication error B1330 Electronic frontal sensor left side wrong ID B1333 Electronic frontal sensor right side defect B1334 Electronic frontal sensor right communication error B1335 Electronic frontal sensor right side wrong ID

CIRCUIT DESCRIPTION
WIRING DIAGRAM


S
R
S
C
M
High (+)
Low (-)
Electronic frontal sensor (LH)
High (+)
Low (-)
Electronic frontal sensor (RH)

INSPECTION PROCEDURE

1. Preparation
   (1) Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.

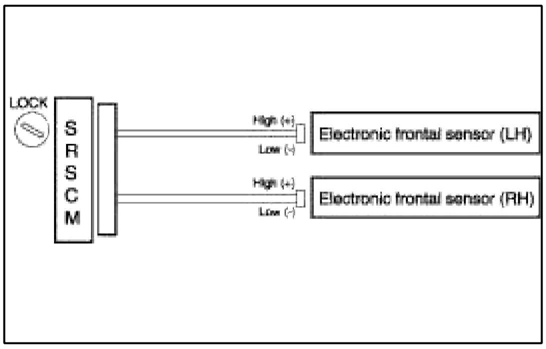
   (2) Remove the DAB module.

   (3) Disconnect the connectors of the PAB, left and right side airbags, belt pretensioners and satellite sensors.

   (4) Disconnect the connector of theSRSCM.

> CAUTION
>
> Place the DAB with the front surface facing upward.

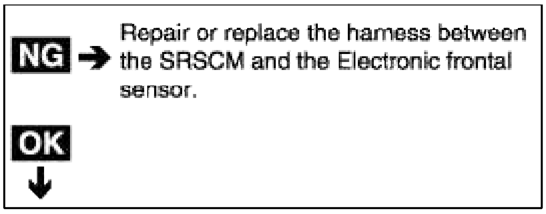
2. Check the Electronic frontal sensor circuits (Communication error).


LOCK
S
R
S
C
M
High (+)
Low (-)
Electronic frontal sensor (LH)
High (+)
Low (-)
Electronic frontal sensor (RH)

[PREPARATION]

Check sensor continuity between sensor SRSCM connector and both electronic frontal sensor connector's high (+) and low (-) sides.

OK : Continuity

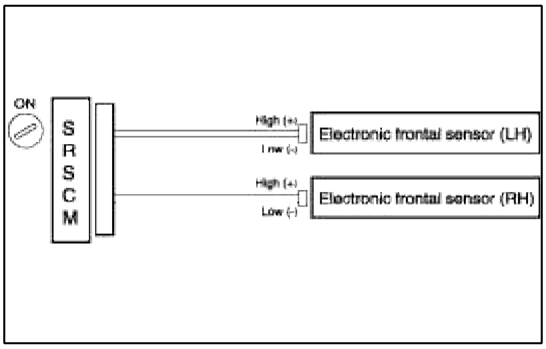


NG ➔ Repair or replace the harness between the SRSCM and the Electronic frontal sensor.

OK

↓

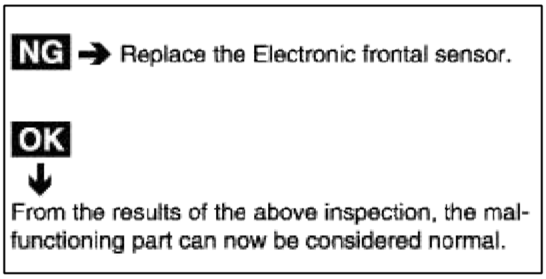
3. Check the Electronic frontal sensor (Defect).
   A. Turn the ignition switch to LOCK.
   B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
   C. Connect the electronic frontal sensor connector.
   D. Connect the negative (-) terminal cable to the battery, and wait for 30 seconds.


ON
SRSCM
High (+)
Low (-)
Electronic frontal sensor (LH)
High (+)
Low (-)
Electronic frontal sensor (RH)

   A. Turn the ignition switch to ON, and wait for at least 30 seconds.
   B. Clear the malfunction code stored in the memory of the Hi-Scan Pro.
   C. Turn the ignition switch to LOCK, and wait for 30 seconds.
   D. Turn the ignition switch to ON, and wait for 30 seconds.
   E. Using the Hi-Scan Pro, check for DTCs.
      There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this check.



NG ➔ Replace the Electronic frontal sensor.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

Restraint > Troubleshooting > B1346

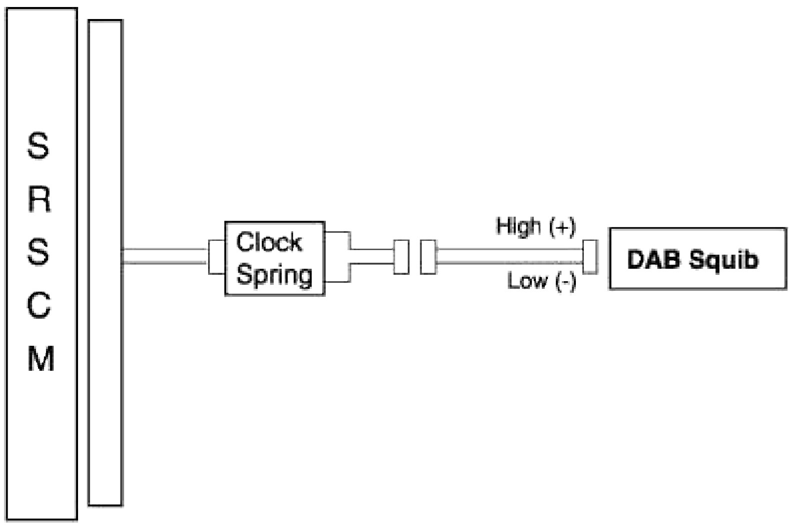
CIRCUIT INSPECTION (DUAL STAGE AIRBAG)

DTC	B1346 DAB resistance too high (R ≥ 6.0Ω) B1347 DAB resistance too low (R ≤ 0.9Ω) B1481 2nd stage DAB resistance too high (R ≥ 6.0Ω) B1482 2nd stage DAB resistance too low (R ≤ 0.9Ω)

CIRCUIT DESCRIPTION

DTC Detecting Condition	Trouble Area
• Too high or low resistane between DAB high (+) wiring harness and DAB low (-) wiring harness of squib. • DAB malfunction • Clock spring malfunction • SRSCM malfunction	• DAB squib • Clock spring • SRSCM • Wire harness • 2nd stage DAB squib

WIRING DIAGRAM



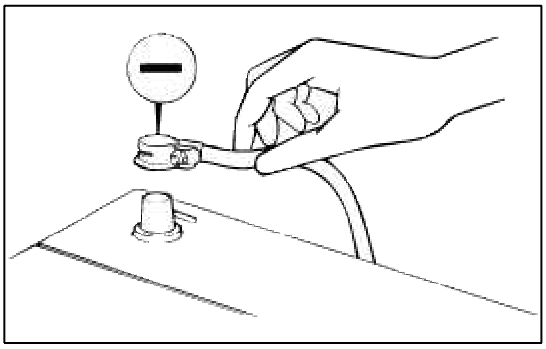
INSPECTION PROCEDURE

1. Preparation
   (1) Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.

   (2) Remove the DAB module.

   (3) Disconnect the connectors of the PAB, left and right side airbags, belt pretensioners and satellite sensors.

(4) Disconnect the SRSCM connector.



WARNING

Place the DAB with the front surface facing upward.

2. Check the DAB resistance.

[PREPARATION]

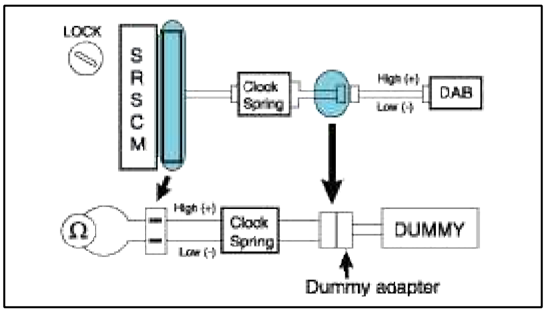
Release the airbag activation prevention mechanism on SRSCM side of airbag squib side. Connect the dummy (0957A-38200) and dummy adapter (0957A-38400) to the clock spring side connector.

WARNING

Never attempt to measure the circuit resistance of the airbag module (squib) even if you are using the specified tester.

NOTE

Before checking the resistance, you have to insert the shorting bar insert plastic that is attached to the diagnosis checker into the SRSCM connector.


LOCK
SRSCM
Clock Spring
High (+)
Low (-)
DAB
Ω
High (+)
Low (-)
Clock Spring
DUMMY
Dummy adapter

[CHECK]

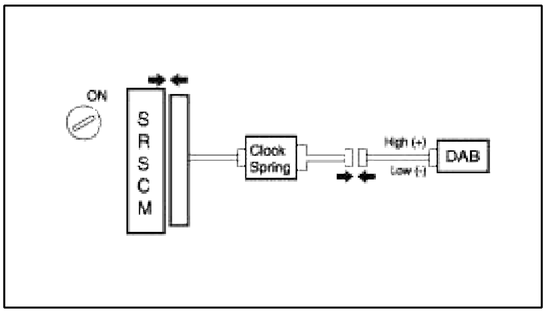
Measure the resistance between the DAB high (+) and low (-).

$1.6\Omega \leq R \leq 4.1\Omega$

NG → Go to step "4"

OK
↓

3. Check the DAB squib.
   A. Turn the ignition switch to LOCK.
   B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
   C. Connect the DAB connector.
   D. Connect the negative (-) terminal cable to the battery, and wait for 30 seconds.

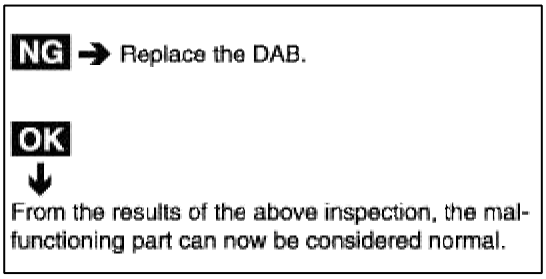


   A. Turn the ignition switch to ON, and wait for at least 30 seconds.
   B. Clear the malfunction code stored in the memory with the Hi-Scan Pro.
   C. Turn the ignition switch to LOCK, and wait for 30 seconds.
   D. Turn the ignition switch to ON, and wait for 30 seconds.
   E. Using Hi-Scan Pro, check the DTC.

There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.



NG → Replace the DAB.

OK
↓
From the results of the above inspection, the malfunctioning part can now be considered normal.

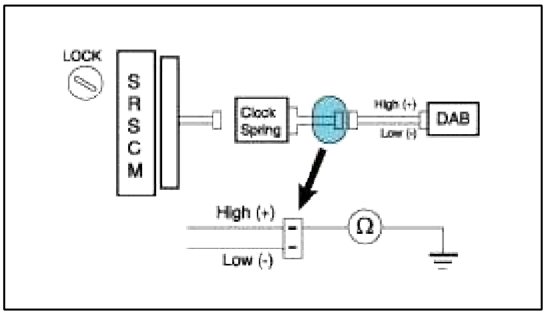
4. Check the clock spring.

[PREPARAION]

Disconnect the connector between the SRSCM clock spring, and connect the dummy connector (0957A-38200) and dummy adapter (0957A-38400) to the clock spring side connector.

WARNING

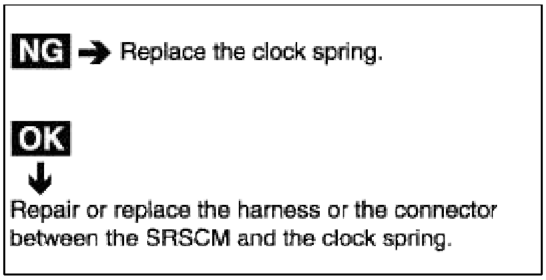
Before checking the resistance, you have to insert the shorting bar insert plastic that is attached to the diagnosis checker into the SRSCM connector.



[CHECK]

Measure the resistance between the DAB high (+) and low (-).

1.6Ω ≤ R ≤ 4.1Ω



NG → Replace the clock spring.

OK
↓
Repair or replace the harness or the connector between the SRSCM and the clock spring.

Restraint > Troubleshooting > B1348

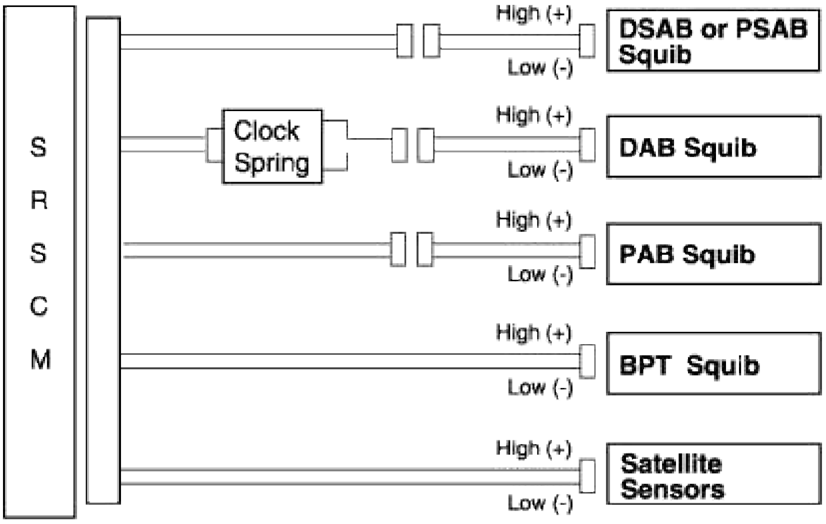
CIRCUIT INSPECTION (SRE-LC)

DTC	B1348 DAB Short to ground B1354 PAB Short to ground B1363 DBPT Short to ground B1369 PBPT Short to ground B1380 DSAB Short to ground B1384 PSAB Short to ground B1401 Satellite sensor left side short to ground B1404 Satellite sensor right side short to ground

CIRCUIT DESCRIPTION

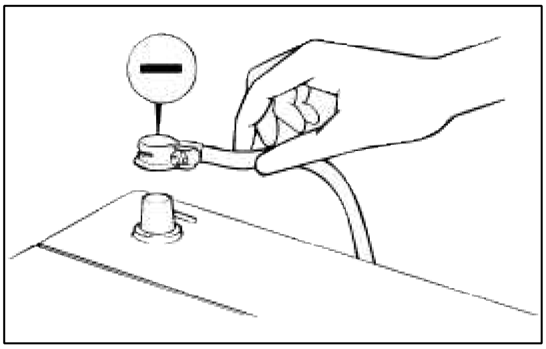
DTC Detecting Condition	Trouble Area
• Short circuit in squib wire harness (to ground) • Squib malfunction • Clock spring malfunction • SRSCM malfunction	• DAB squib • PAB squib • DSAB squib • PSAB squib • BPT squib • Satellite sensor • Clock spring • SRSCM • Wire harness

WIRING DIAGRAM


S R S C M
Clock Spring
High (+)
Low (-)
DSAB or PSAB Squib
DAB Squib
PAB Squib
BPT Squib
Satellite Sensors

INSPECTION PROCEDURE

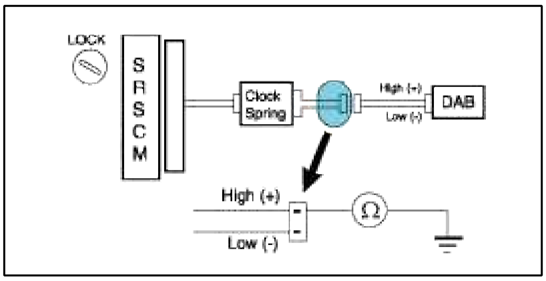
1. Preparation
   (1) Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.
   (2) Remove the DAB module.
   (3) Disconnect the connectors of the PAB, left and right side airbags, belt pretensioners and satellite sensors.
   (4) Disconnect the SRSCM connector.



WARNING

Place the DAB with the front surface facing upward.

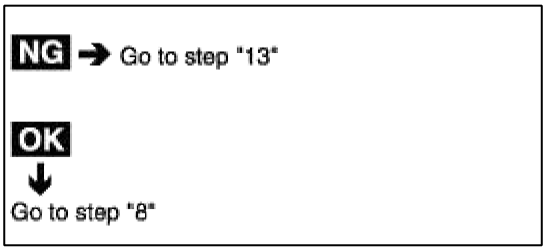
2. Check the DAB squib circuit.


LOCK
SRSCM
Clock Spring
High (+)
Low (-)
DAB
High (+)
Low (-)
Ω

[CHECK]

For the connector (on the clock spring side) between the clock spring and the DAB, measure the resistance between the DAB high and body ground.

Resistance: ∞



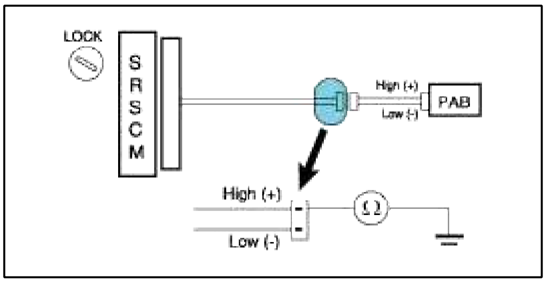
NG ➔ Go to step "13"

OK

↓

Go to step "8"

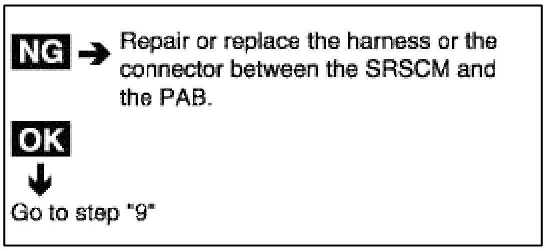
3. Check the PAB squib circuit.


LOCK
SRSCM
High (+)
Low (-)
PAB
High (+)
Low (-)
Ω

[CHECK]

For the connector (on the SRSCM side) between the SRSCM and the PAB, measure the resistance between the PAB high and body ground.

Resistance: ∞



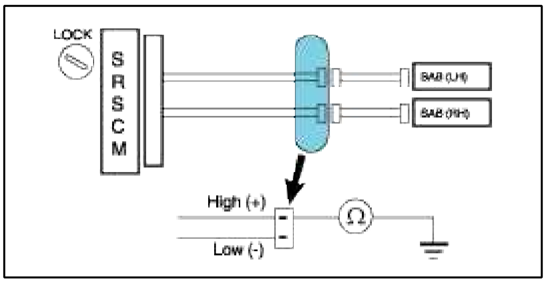
NG ➔ Repair or replace the harness or the connector between the SRSCM and the PAB.

OK

↓

Go to step "9"

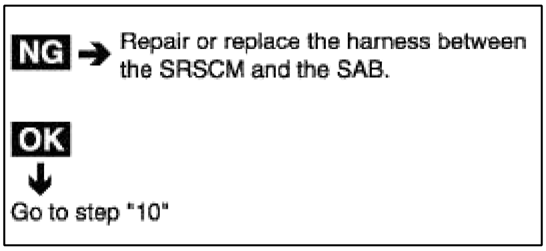
4. Check the PSAB and DSAB squib circuit.


LOCK
S R S C M
SAB (LH)
SAB (RH)
High (+)
Low (-)
Ω

[CHECK]

For the connector (on the SRSCM side) between the SRSCM and the SAB, measure the resistance between the SAB high and body ground.

Resistance: ∞



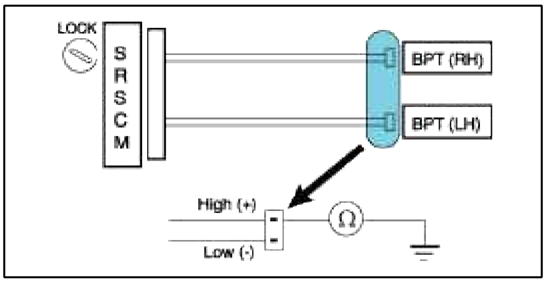
NG ➔ Repair or replace the harness between the SRSCM and the SAB.

OK

↓

Go to step "10"

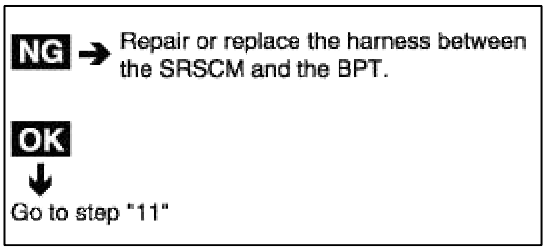
5. Check the BPT squib circuit.


LOCK
S R S C M
BPT (RH)
BPT (LH)
High (+)
Low (-)
Ω

[CHECK]

For the connector (on the SRSCM side) between the SRSCM and the BPT, measure the resistance between the BPT high and body ground.

Resistance: ∞



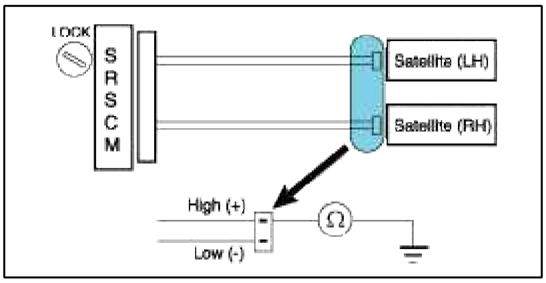
NG ➔ Repair or replace the harness between the SRSCM and the BPT.

OK

↓

Go to step "11"

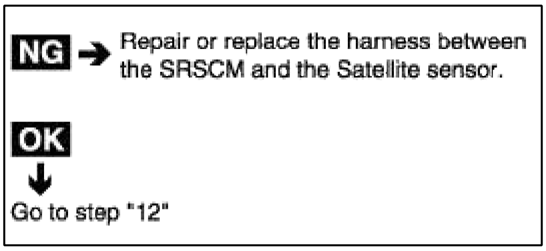
6. Check the Satellite sensor circuit.



[CHECK]

For the connector (on the SRSCM side) between the SRSCM and the Satellite sensor, measure the resistance between the Satellite high and body ground.

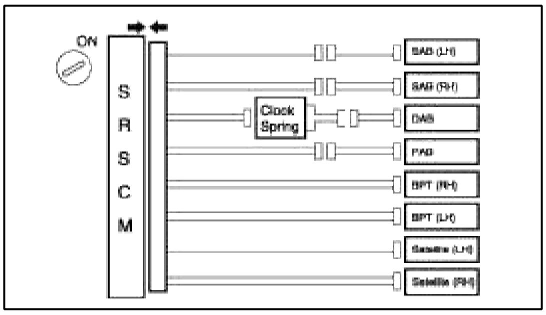
Resistance: ∞



NG ➔ Repair or replace the harness between the SRSCM and the Satellite sensor.

OK
↓
Go to step "12"

7. Check the SRSCM.
   - A. Connect the connector to the SRSCM.
   - B. Using a service wire, connect the DAB high and the DAB low to the clock spring side connector between the clock spring and the DAB.
   - C. Using a service wire, connect the PAB high and low on the SRSCM side of the connector between the SRSCM and the PAB.
   - D. Connect the SAB and the BPT by the same method.
   - E. Connect the negative (-) terminal cable to the battery, and wait least 30 seconds.

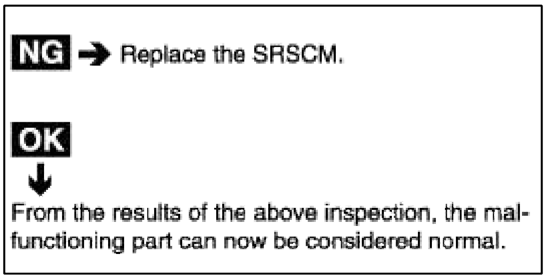


A. Turn the ignition switch to ON, and wait at least 30 seconds.
B. Clear the malfunction code stored in the memory with the Hi-Scan Pro.
C. Turn the ignition switch to LOCK, and wait for 30 seconds.
D. Turn the ignition switch to ON, and wait for 30 seconds.
E. Using Hi-Sacn Pro, check the DTC.

There is no DTC.

[HINT]

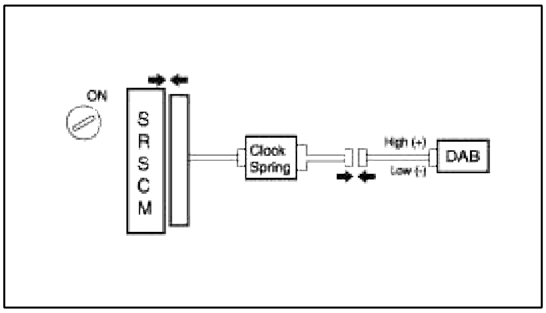
Codes other than these ones may be output at this time, but they are not relevantto this check.



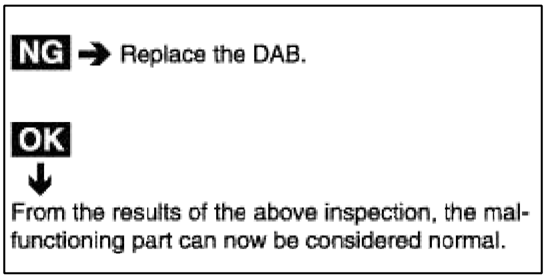
NG ➔ Replace the SRSCM.

OK
↓
From the results of the above inspection, the malfunctioning part can now be considered normal.

8. Check the DAB squib.
   A. Turn the ignition switch to LOCK.
   B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
   C. Connect the the DAB connector.
   D. Connect the negative (-) terminal cable to the battery, and wait for 30 seconds.



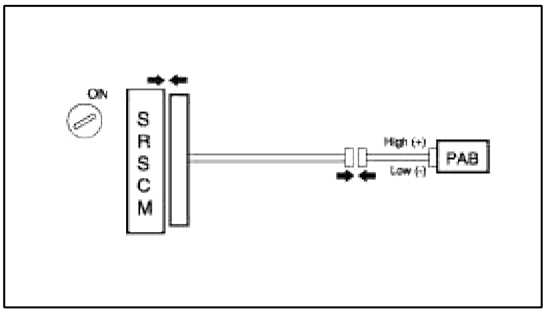
   A. Turn the ignition switch to ON, and wait for at least 30 seconds.
   B. Clear the malfunction code stored in the memory with the Hi-Scan Pro.
   C. Turn the ignition switch to LOCK, and wait for 30 seconds.
   D. Turn the ignition switch to ON, and wait for 30 seconds.
   E. Using the Hi-scan, check the DTC.
   There is no DTC.



NG → Replace the DAB.

OK
↓
From the results of the above inspection, the malfunctioning part can now be considered normal.

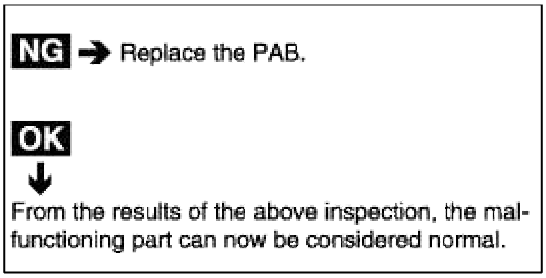
9. Check the PAB squib.
   A. Turn the ignition switch to LOCK.
   B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
   C. Connect the the PAB connector.
   D. Connect the negative (-) terminal cable from the battery, and wait for 30 seconds.



   A. Turn the ignition switch to ON, and wait for at least 30 seconds.
   B. Clear the malfunction code stored in the memory with Hi-Scan Pro.
   C. Turn the ignition switch to LOCK, and wait for 30 seconds.
   D. Turn the ignition switch to ON, and wait for 30 seconds.
   E. Using the Hi-Sacn Pro, check the DTC.
   There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.



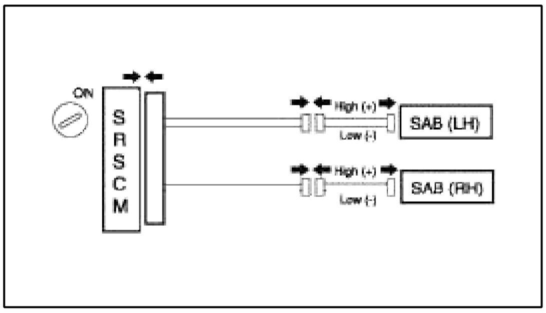
NG ➔ Replace the PAB.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

10. Check the SAB squib.
    - A. Turn the ignition switch to LOCK.
    - B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
    - C. Connect the the SAB connector.
    - D. Connect the negative (-) terminal cable from the battery, and wait for 30 seconds.

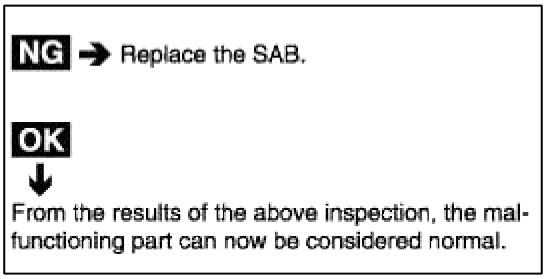


- A. Turn the ignition switch to ON, and wait for at least 30 seconds.
- B. Clear the malfunction code stored in the memory with the Hi-Scan Pro.
- C. Turn the ignition switch to LOCK, and wait for 30 seconds.
- D. Turn the ignition switch ON, and wait for 30 seconds.
- E. Using the Hi-Sacn Pro, check the DTC.

  There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.



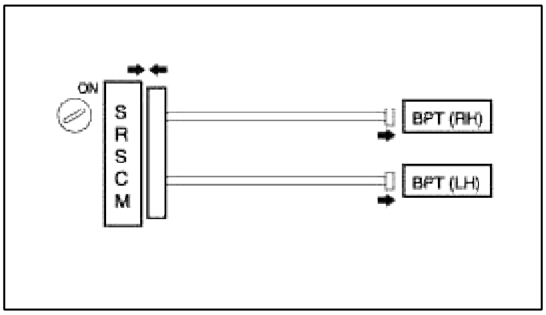
NG ➔ Replace the SAB.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

11. Check the BPT squib.
    A. Turn the ignition swich to LOCK.
    B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
    C. Connect the BPT connector.
    D. Connect the negative (-) terminal cable from the battery, and wait for 30 seconds.

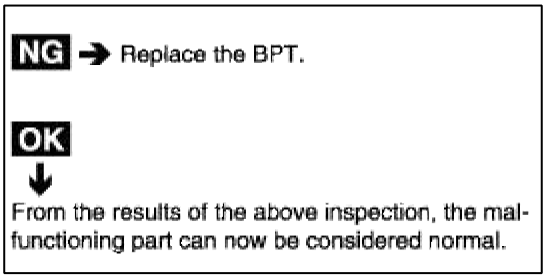


A. Turn the ignition switch to ON, and wait for 30 seconds.
B. Clear the malfunction code stored in the memory with the Hi-Scan Pro.
C. Turn the ignition switch to LOCK, and wait for 30 seconds.
D. Turn the ignition switch to ON, and wait for 30 seconds.
E. Using the Hi-Scan Pro, check the DTC.

There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.



NG → Replace the BPT.

OK

↓

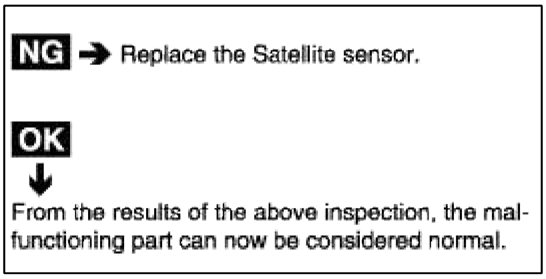
From the results of the above inspection, the malfunctioning part can now be considered normal.

12. Check the Satellite sensors.
    A. Turn ignition switch to LOCK.
    B. Disconnect negative (-) terminal cable from the battery, and wait at least 30 seconds.
    C. Connect the Satellite sensor connector.
    D. Connect the negative (-) terminal cable from the battery, and wait at least 30 seconds.
    A. Turn the ignition switch to ON, and wait at least 30 seconds.
    B. Clear the malfunction code stored in memory with the Hi-Scan Pro.
    C. Turn the ignition switch to LOCK, and wait at least 30 seconds.
    D. Turn the ignition switch to ON, and wait at least 30 seconds.
    E. Using the Hi-Scan Pro, check for DTCs.

There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.



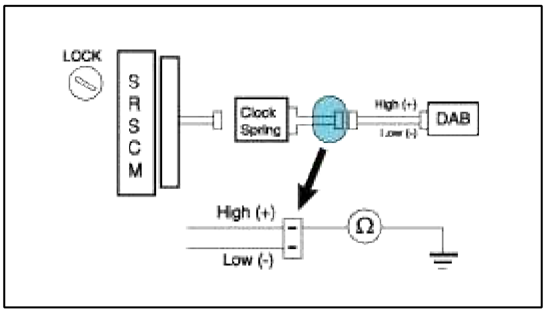
NG → Replace the Satellite sensor.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

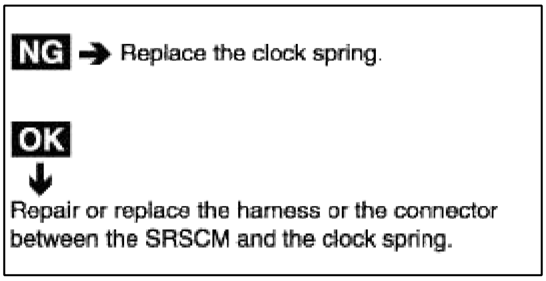
13. Check the clock spring circuit.



[CHECK]

Measure the resistance between the DAB high on the clock spring side of the connector between the clock spring and the DAB and body ground.

Resistance: ∞



NG ➔ Replace the clock spring.

OK

↓

Repair or replace the harness or the connector between the SRSCM and the clock spring.

Restraint > Troubleshooting > B1349

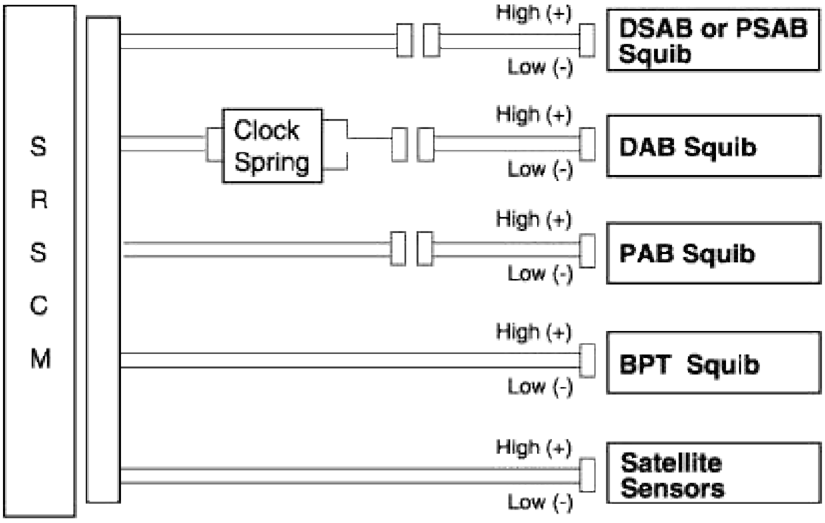
CIRCUIT INSPECTION (SRE-LC)

DTC	B1349 DAB Short to battery B1355 PAB Short to battery B1364 BPT (Driver) Short to battery B1370 BPT (Passenger) Short to battery B1381 SAB (Driver) short to battery B1385 SAB (Passenger) short to battery B1402 Satellite left side short to battery B1405 Satellite right side short to battery

CIRCUIT DESCRIPTION

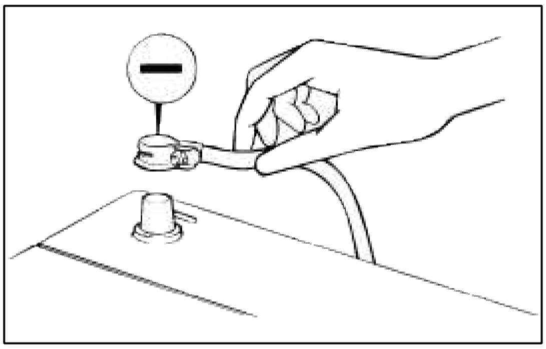
DTC Detecting Condition	Trouble Area
• Short circuit in squib wire harness (to B+) • Squib malfunction • Spiral cable malfunction • SRSCM malfunction	• DAB squib • PAB squib • DSAB or PSAB squib • BPT squib • Satellite sensor • Wire harness

WIRING DIAGRAM


S
R
S
C
M
Clock Spring
High (+)
Low (-)
DSAB or PSAB Squib
DAB Squib
PAB Squib
BPT Squib
Satellite Sensors

INSPECTION PROCEDURE

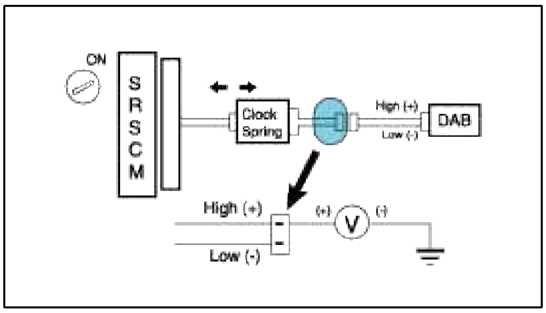
1. Preparation
   - (1) Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.
   - (2) Remove the DAB module.
   - (3) Disconnect the connectors of the PAB, left and right side airbags, belt pretensioners and satellite sensors.
   - (4) Disconnect the SRSCM connector.



WARNING

Place the DAB with the front surface facing upward.

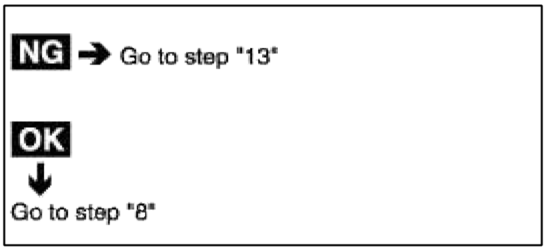
2. Check the DAB squib circuit.


ON
SRSCM
Clock Spring
High (+)
Low (-)
DAB
High (+)
Low (-)
(+)
V
(-)

[CHECK]

For the connector (on the clock spring side) between the clock spring and the DAB, measure the voltage between the DAB high and body ground.

Voltage : 0 V



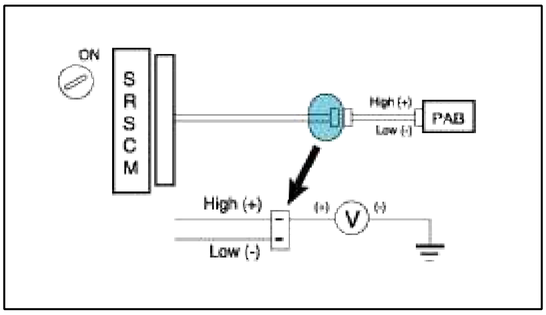
NG ➔ Go to step "13"

OK

↓

Go to step "8"

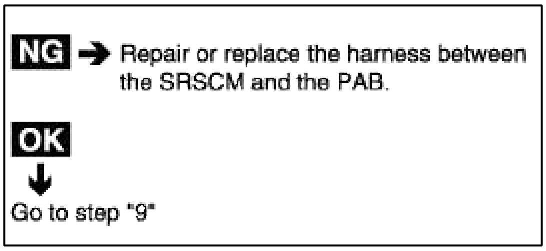
3. Check the PAB squib circuit.


ON
SRSCM
High (+)
Low (-)
PAB
High (+)
Low (-)
(+)
V
(-)

[CHECK]

For the connector (on the SRSCM side) between the SRSCM and the PAB, measure the voltage between the PAB high and body ground.

Voltage : 0 V



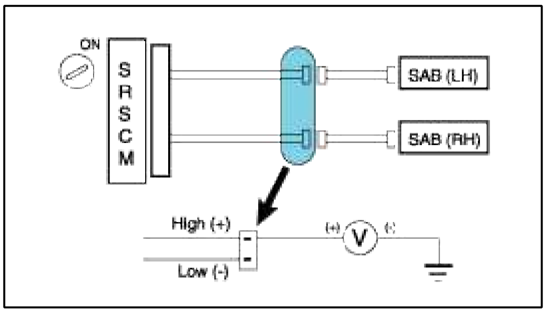
NG ➔ Repair or replace the harness between the SRSCM and the PAB.

OK

↓

Go to step "9"

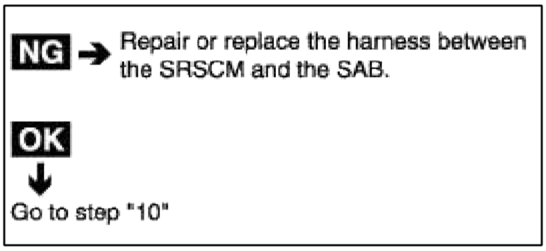
4. Check the SAB squib circuit.


ON
SRSCM
SAB (LH)
SAB (RH)
High (+)
Low (-)
(+)
V
(-)

[CHECK]

For the connector (on the SRSCM side) between the SRSCM and the SAB, measure the voltage between the SAB high and body ground.

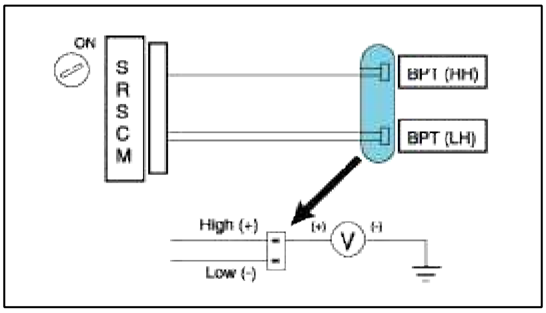
Voltage : 0 V



NG ➔ Repair or replace the harness between the SRSCM and the SAB.

OK
↓
Go to step "10"

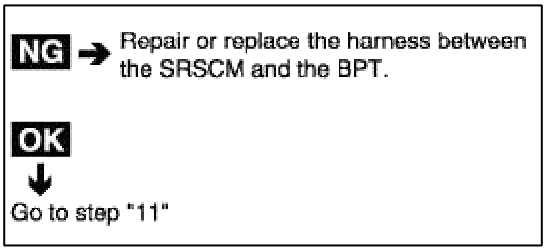
5. Check the BPT squib circuit.


ON
SRSCM
BPT (RH)
BPT (LH)
High (+)
Low (-)
(+)
V
(-)

[CHECK]

For the connector between the SRSCM and the BPT, measure the voltage between the BPT high and body ground.

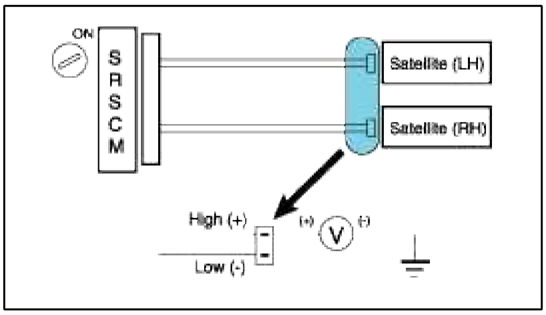
Voltage : 0 V



NG ➔ Repair or replace the harness between the SRSCM and the BPT.

OK
↓
Go to step "11"

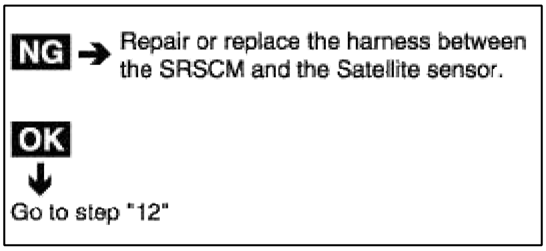
6. Check the Satellite sensor circuit.



[CHECK]

For the connector between the SRSCM and the Satellite sensor, measure the voltage between the Satellite sensor high and body ground.

Voltage : 0 V



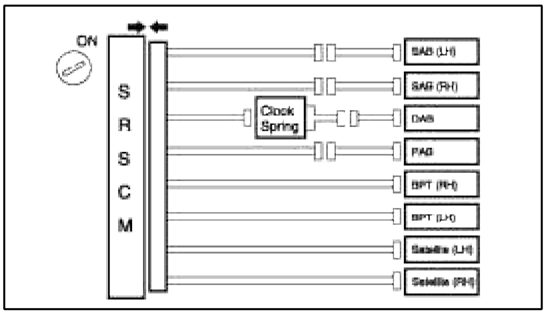
NG ➔ Repair or replace the harness between the SRSCM and the Satellite sensor.

OK

↓

Go to step "12"

7. Check the SRSCM.

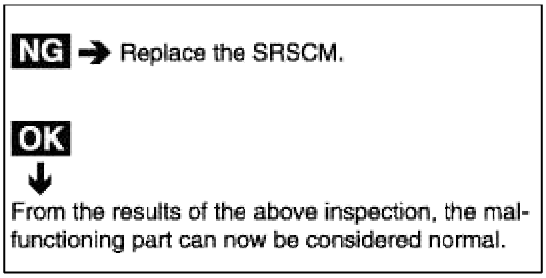


A. Connect the connector to the SRSCM.
B. Using a service wire, connect the DAB high and low on the clock spring side of the connector between the clock spring and the DAB.
C. Using a service wire, connect the PAB high and low on the SRSCM side of the connector between the SRSCM and the PAB.
D. Using a service wire, connect the SAB high and low on the SRSCM side connector between the SRSCM and the SAB.
E. Using a service wire, connect the BPT high and low on the SRSCM side connector between the SRSCM and the BPT.
F. Using a service wire, connect the satellite high and low on the SRSCM side connector between the SRSCM and the satellite sensor.
G. Connect negative (-) battery cable to the battery, and wait at least 30 seconds.
A. Turn the ignition switch to ON, and wait at least 30 seconds.
B. Clear the malfunction code stored in memory with Hi-Scan Pro.
C. Turn the ignition switch to LOCK, and wait at least 30 seconds.
D. Turn the ignition switch to ON, and wait at least 30 seconds.
E. Using Hi-Scan Pro, check the DTC.

There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this check.



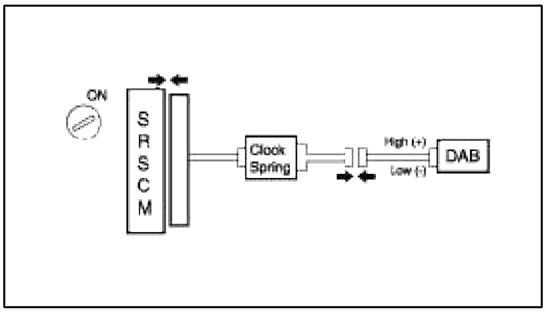
NG ➔ Replace the SRSCM.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

8. Check the DAB squib.
   A. Turn the ignition switch to LOCK.
   B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
   C. Connect the DAB connector.
   D. Connect the negative (-) terminal cable to the battery, and wait for 30 seconds.

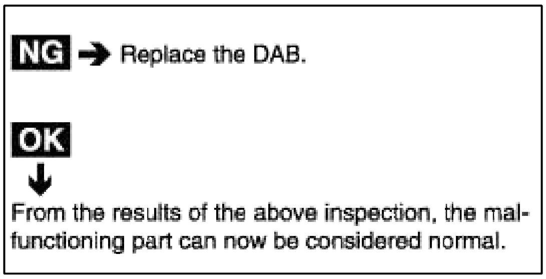


   A. Turn the ignition switch to ON, and wait for at least 30 seconds.
   B. Clear the malfunction code stored in the memory with the Hi-Scan Pro.
   C. Turn the ignition switch to LOCK, and wait for 30 seconds.
   D. Turn the ignition switch to ON, and wait for 30 seconds.
   E. Using Hi-Scan Pro, check the DTC.

There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.



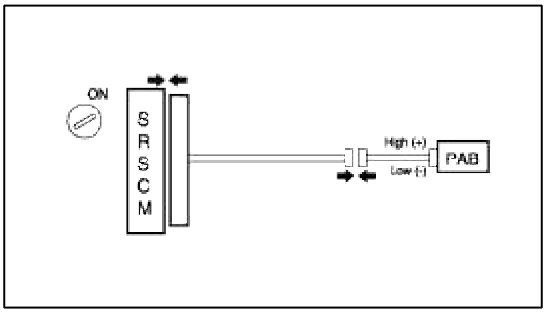
NG ➔ Replace the DAB.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

9. Check the PAB squib.
   A. Turn the ignition switch to LOCK.
   B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
   C. Connect the the PAB connector.
   D. Connect the negative (-) terminal cable from the battery, and wait for 30 seconds.

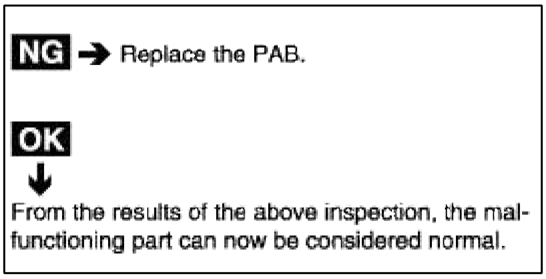


   A. Turn the ignition switch to ON, and wait for at least 30 seconds.
   B. Clear the malfunction code stored in the memory with Hi-Scan Pro.
   C. Turn the ignition switch to LOCK, and wait for 30 seconds.
   D. Turn the ignition switch ON, and wait for 30 seconds.
   E. Using the Hi-Sacn Pro, check the DTC.

DTC is not output.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.



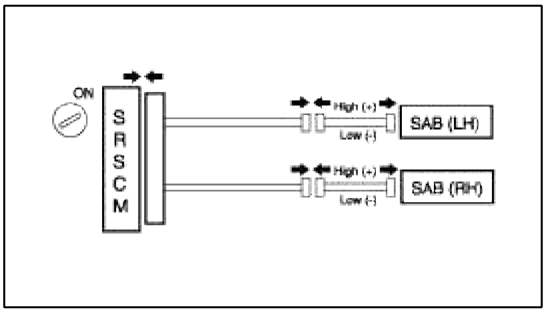
NG ➔ Replace the PAB.

OK

⬇

From the results of the above inspection, the malfunctioning part can now be considered normal.

10. Check the SAB squib.
    A. Turn the ignition switch to LOCK.
    B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
    C. Connect the SAB connector.
    D. Connect the negative (-) terminal cable from the battery, and wait for 30 seconds.

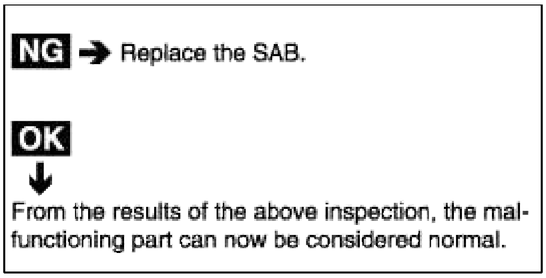


    A. Turn the ignition switch to ON, and wait for at least 30 seconds.
    B. Clear the malfunction code stored in the memory with Hi-Scan Pro.
    C. Turn the ignition switch to LOCK, and wait for 30 seconds.
    D. Turn the ignition switch ON, and wait for 30 seconds.
    E. Using the Hi-Sacn Pro, check the DTC.

There is no DTC.

[HINT]

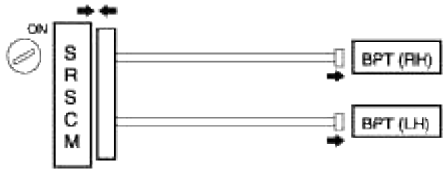
Codes other than these ones may be output at this time, but they are not relevant to this checking procedure.



NG → Replace the SAB.

OK
↓
From the results of the above inspection, the malfunctioning part can now be considered normal.

11. Check the BPT squib.
   A. Turn the ignition swich to LOCK.
   B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
   C. Connect the the BPT connector.
   D. Connect the negative (-) terminal cable from the battery, and wait for 30 seconds.

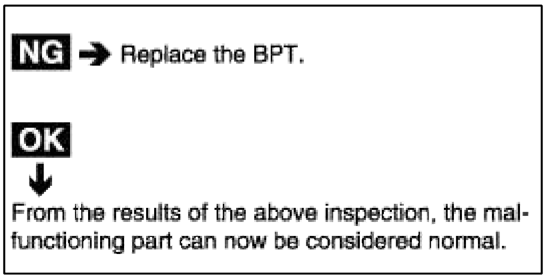


   A. Turn the ignition switch to ON, and wait for 30 seconds.
   B. Clear the malfunction code stored in the memory with the Hi-Scan Pro.
   C. Turn the ignition switch to LOCK, and wait for 30 seconds.
   D. Turn the ignition switch to ON, and wait for 30 seconds.
   E. Using the Hi-Scan Pro check the DTC.

   There is no DTC.

[HINT]

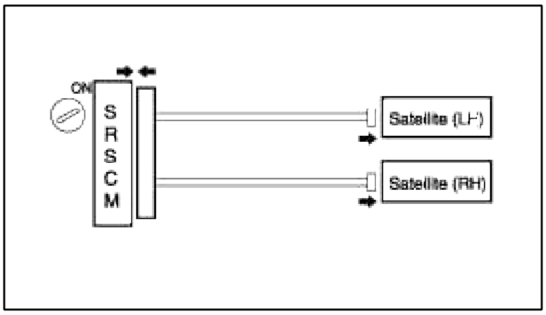
Codes other than these may be output at this time, but they are not relevant to this procedure.



NG → Replace the BPT.

OK
↓
From the results of the above inspection, the malfunctioning part can now be considered normal.

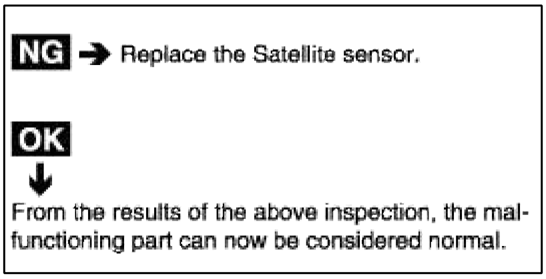
12. Check the Satellite sensors.
    A. Turn ignition switch to LOCK.
    B. Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.
    C. Connect the Satellite sensor connector.
    D. Connect the negative (-) terminal cable from the battery, and wait at least 30 seconds.



A. Turn the ignition switch to ON, and wait at least 30 seconds.
B. Clear the malfunction code stored in memory with Hi-scan Pro.
C. Turn the ignition switch to LOCK, and wait at least 30 seconds.
D. Turn the ignition switch to ON, and wait at least 30 seconds.
E. Using the Hi-Scan Pro, check for DTCs.
There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.



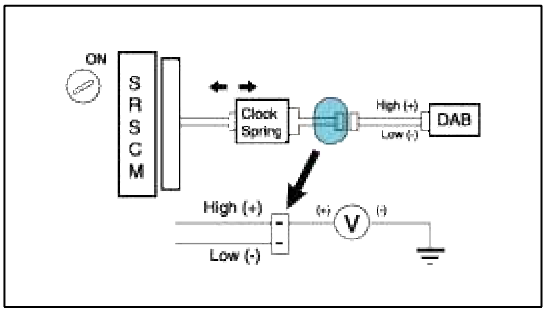
NG → Replace the Satellite sensor.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

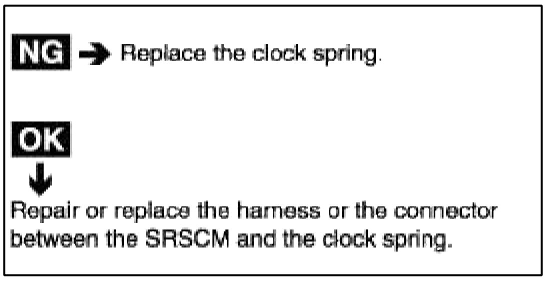
13. Check the clock spring.
    A. Turn the ignition switch to LOCK.
    B. Disconnect the connector between the SRSCM and the clock spring.



[CHECK]

Turn the ignition switch to ON, and measure voltage between the DAB high and body ground.

Voltage : 0 V



NG → Replace the clock spring.

OK

↓

Repair or replace the harness or the connector between the SRSCM and the clock spring.

Restraint > Troubleshooting > B1352

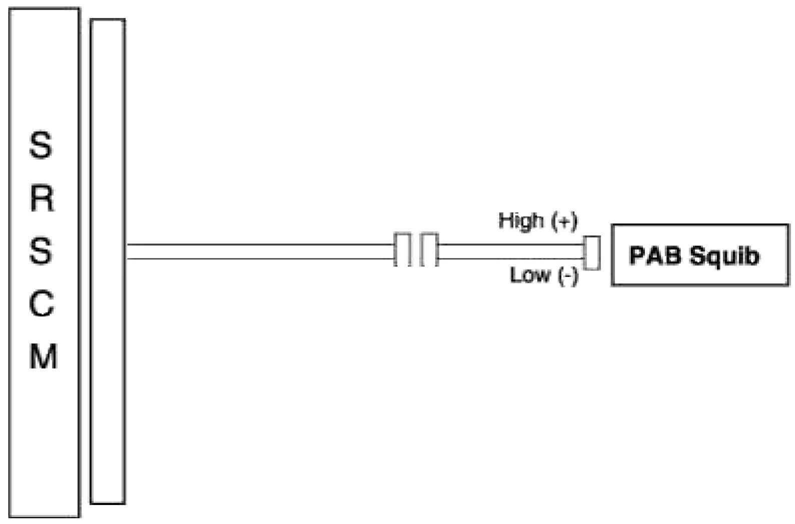
CIRCUIT INSPECTION (DUAL STAGE AIRBAG)

DTC	B1352 PAB resistance too high (R ≥ 4.2Ω) B1353 PAB resistance too low (R ≤ 1.0Ω) B1485 2nd stage PAB resistance too high (R ≥ 4.2Ω) B1486 2nd stage PAB resistance too low (R ≤ 1.0Ω)

CIRCUIT DESCRIPTION

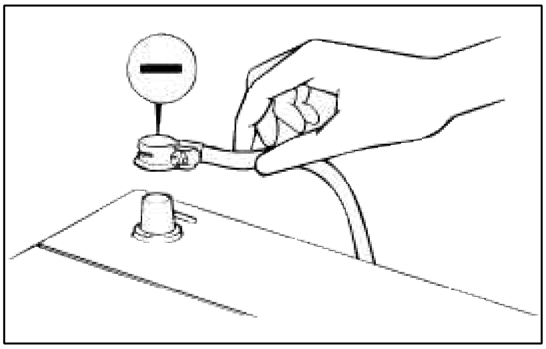
DTC Detecting Condition	Trouble Area
• Too high or low resistane between PAB high (+) wiring harness and PAB low (-) wiring harness of squib. • PAB malfunction • SRSCM malfunction	• PAB squib • SRSCM • Wire harness • 2nd stage PAB squib

WIRING DIAGRAM



INSPECTION PROCEDURE

1. Preparation
   (1) Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.
   (2) Remove the DAB module.
   (3) Disconnect the connectors of the PAB, left and right side airbags, belt pretensioners and satellite sensors.
   (4) Disconnect the SRSCM connector.



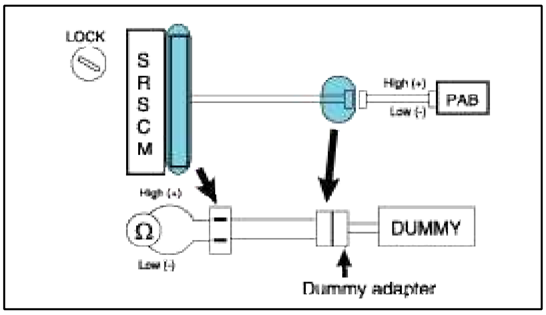
> **WARNING**
>
> Place the DAB with the front surface facing upward.

2. Check the PAB resistance.

[PREPARATION]

Release the airbag activation prevention mechanism on the SRSCM side of the airbag squib side. Connect the dummy (0957A-25100) and dummy adapter (0957A-38300) to PAB connector of the SRSCM connector side.

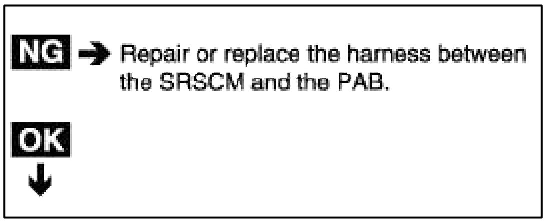
> **WARNING**
>
> Before checking the resistance, you have to insert the shorting bar insert plastic that is attached to the diagnosis checker into the SRSCM connector.



[CHECK]

Measure the resistance between the PAB high (+) and the PAB low (-).

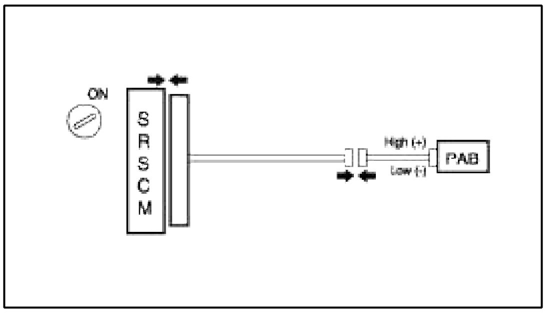
$1.8\Omega \leq R \leq 2.8\Omega$



NG ➔ Repair or replace the harness between the SRSCM and the PAB.

OK
↓

3. Check the PAB squib.
   A. Turn the ignition switch to LOCK.
   B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
   C. Connect the PAB connector.
   D. Connect the negative (-) terminal cable to the battery, and wait for 30 seconds.

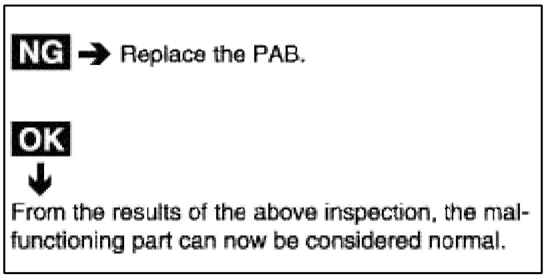


   A. Turn the ignition switch to ON, and wait for at least 30 seconds.
   B. Clear the malfunction code stored in the memory with the Hi-Scan Pro.
   C. Turn the ignition switch to LOCK, and wait for 30 seconds.
   D. Turn the ignition switch to ON, and wait for 30 seconds.
   E. Using Hi-Scan Pro, check the DTC.

There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.



NG ➔ Replace the PAB.

OK
↓
From the results of the above inspection, the malfunctioning part can now be considered normal.

Restraint > Troubleshooting > B1361

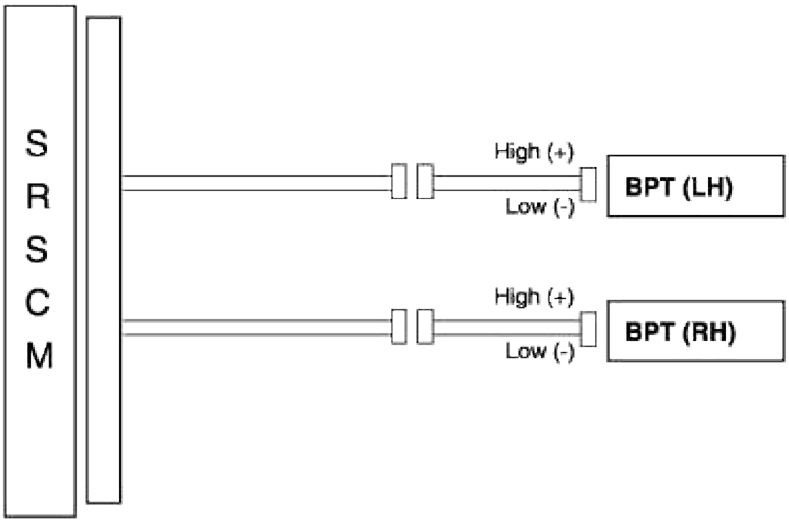
CIRCUIT INSPECTION (DUAL STAGE AIRBAG)

DTC	B1361 DBPT Resistance too high (R ≥ 4.7Ω) B1362 DBPT Resistance too low (R ≤ 0.9Ω) B1367 PBPT Resistance too high (R ≥ 4.7Ω) B1368 PBPT Resistance too low (R ≤ 0.9Ω)

CIRCUIT DESCRIPTION

DTC Detecting Condition	Trouble Area
• Too high or low resistane between BPT high (+) wiring harness and BPT low (-) wiring harness of squib. • BPT malfunction • SRSCM malfunction	• BPT squib • SRSCM • Wire harness

WIRING DIAGRAM



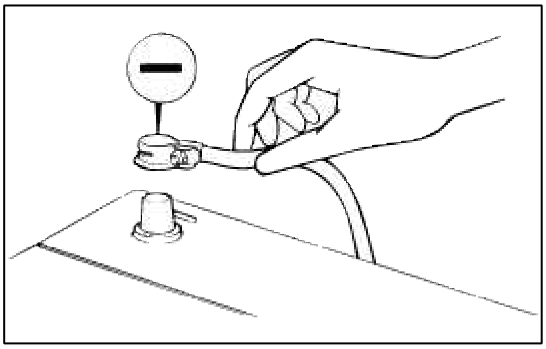
INSPECTION PROCEDURE

1. Preparation
   (1) Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.

   (2) Remove the DAB module.

   (3) Disconnect the connectors of the PAB, left and right side airbags, belt pretensioners and satellite sensors.

   (4) Disconnect the SRSCM connector.



WARNING

Place the DAB with the front surface facing upward.

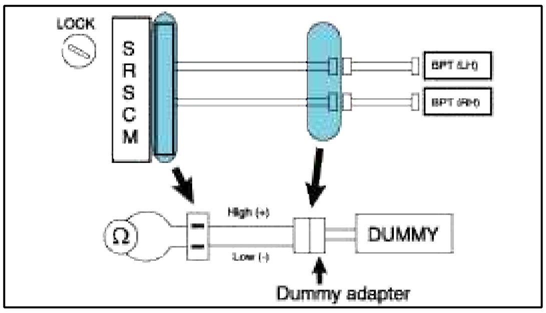
2. Check the BPT resistance.

   [PREPARATION]

   Release the airbag activation prevention mechanism on the SRSCM side of the airbag squib side. Connect the dummy (0957A-38200) and dummy adapter (0957A-38400) to the BPT connector of the SRSCM connector side.

   NOTE

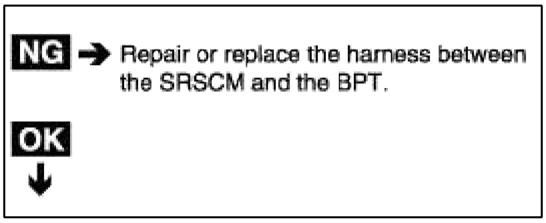
   Before checking the resistance, you have to insert the shorting bar insert plastic that is attached to the diagnosis checker into the SRSCM connector.



   [CHECK]

   Measure the resistance between the BPT high (+) and the BPT low (-).

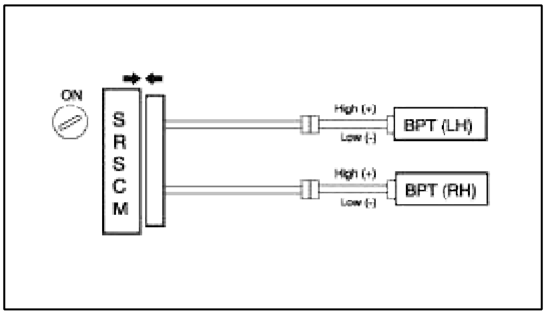
   1.8Ω ≤ R ≤ 3.1Ω



NG → Repair or replace the harness between the SRSCM and the BPT.

OK ↓

3. Check the BPT squib.
   - A. Turn the ignition switch to LOCK.
   - B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
   - C. Connect the BPT connector.
   - D. Connect the negative (-) terminal cable to the battery, and wait for 30 seconds.

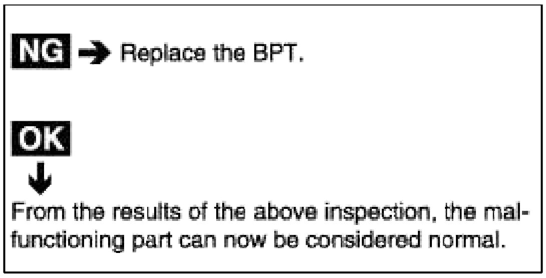


   - A. Turn the ignition switch to ON, and wait for at least 30 seconds.
   - B. Clear the malfunction code stored in the memory with the Hi-Scan Pro.
   - C. Turn the ignition switch to LOCK, and wait for 30 seconds.
   - D. Turn the ignition switch to ON, and wait for 30 seconds.
   - E. Using Hi-Scan Pro, check the DTC.

     There is no DTC.

   [HINT]

   Codes other than these may be output at this time, but they are not relevant to this procedure.



NG → Replace the BPT.

OK
↓
From the results of the above inspection, the malfunctioning part can now be considered normal.

Restraint > Troubleshooting > B1378

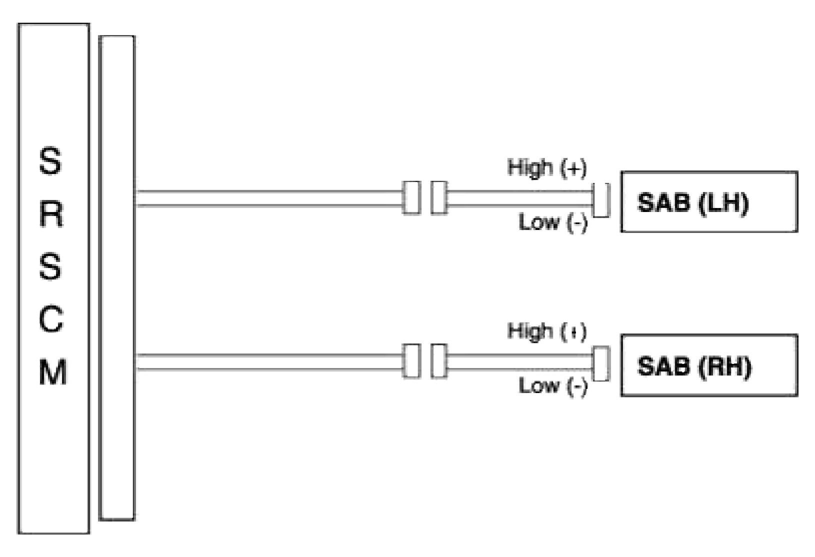
CIRCUIT INSPECTION (DUAL STAGE AIRBAG)

DTC	B1378 DSAB Resistance too high (R ≥ 4.2Ω) B1379 DSAB Resistance too low (R ≤ 1.0Ω) B1382 PSAB Resistance too high (R ≥ 4.2Ω) B1383 PSAB Resistance too low (R ≤ 1.0Ω)

CIRCUIT DESCRIPTION

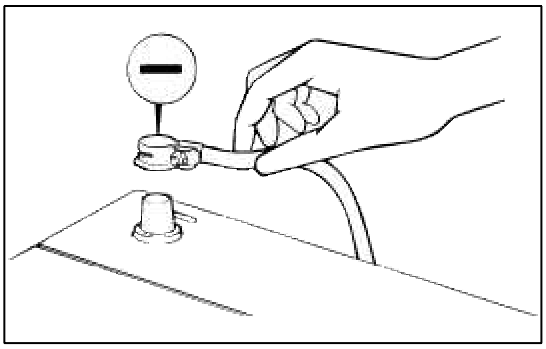
DTC Detecting Condition	Trouble Area
• Too high or low resistane between SAB high (+) wiring harness and SAB low (-) wiring harness of squib. • SAB malfunction • SRSCM malfunction	• SAB squib • SRSCM • Wire harness

WIRING DIAGRAM



INSPECTION PROCEDURE

1. Preparation
   (1) Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.
   (2) Remove the DAB module.
   (3) Disconnect the connectors of the PAB, left and right side airbags, belt pretensioners and satellite sensors.
   (4) Disconnect the SRSCM connector.

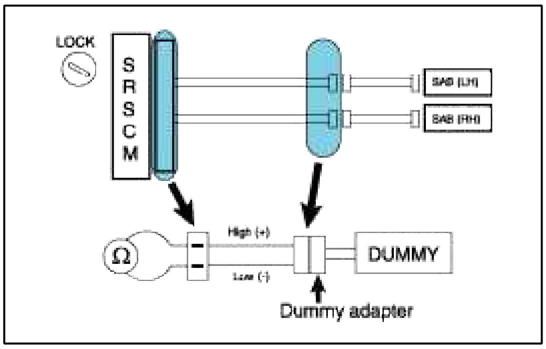


> **WARNING**
>
> Place the DAB with the front surface facing upward.

2. Check the SAB resistance.

   [PREPARATION]

   Release the airbag activation prevention mechanism on the SRSCM side of the airbag squib side. Connect the dummy (0957A-38200) and dummy adapter (0957A-38300) to the SAB connector of the SRSCM connector side.

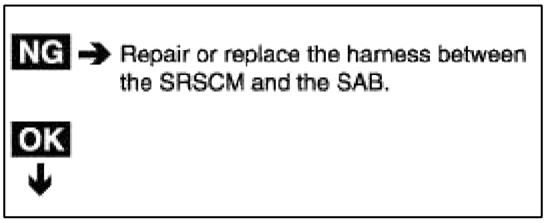


> **WARNING**
>
> Before checking the resistance, you have to insert the shorting bar insert plastic that is attached to the diagnosis checker into the SRSCM connector.

   [CHECK]

   Measure the resistance between the SAB high (+) and the SAB low (-).

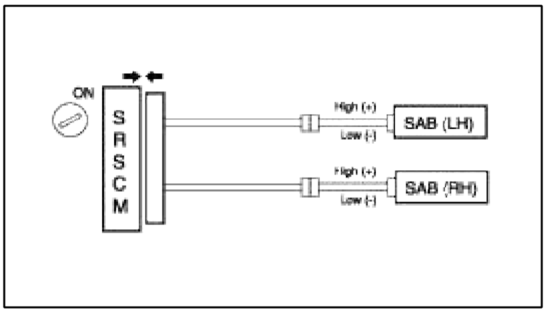
   1.8Ω ≤ R ≤ 2.8Ω



NG ➔ Repair or replace the harness between the SRSCM and the SAB.

OK
↓

3. Check the SAB squib.
   - A. Turn the ignition switch to LOCK.
   - B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
   - C. Connect the SAB connector.
   - D. Connect the negative (-) terminal cable to the battery, and wait for 30 seconds.

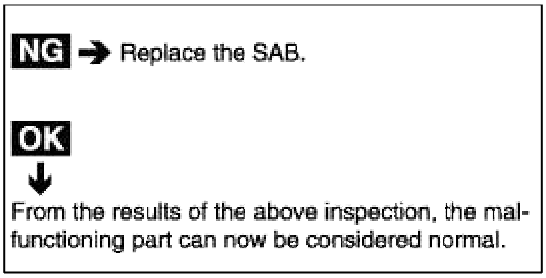


   - A. Turn the ignition switch to ON, and wait for at least 30 seconds.
   - B. Clear the malfunction code stored in the memory with the Hi-Scan Pro.
   - C. Turn the ignition switch to LOCK, and wait for 30 seconds.
   - D. Turn the ignition switch to ON, and wait for 30 seconds.
   - E. Using Hi-Scan Pro, check the DTC.

     There is no DTC.

   [HINT]

   Codes other than these may be output at this time, but they are not relevant to this procedure.


NG → Replace the SAB.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

Restraint > Troubleshooting > B1387

CIRCUIT INSPECTION (DUAL STAGE AIRBAG)

DTC	B1387 Driver seat track position sensor short to GND B1388 Driver seat track position sensor short to Battery B1389 Driver seat track position sensor defect B1390 Passenger seat track position sensor short to GND B1391 Passenger seat track position sensor short to Battery B1392 Passenger seat track position sensor defect

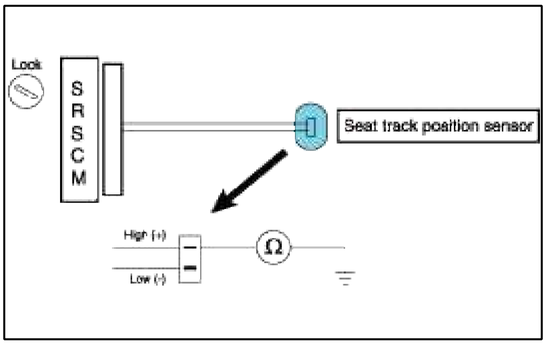
CIRCUIT DESCRIPTION

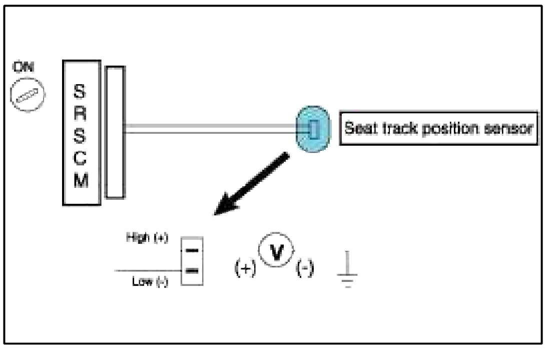
INSPECTION PROCEDURE

1. Preparation
   (1) Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.
   (2) Remove the DAB module.
   (3) Disconnect the connectors of the PAB, left and right side airbags, belt pretensioners and satellite sensors.
   (4) Disconnect the connector of theSRSCM.

> CAUTION
>
> Place the DAB with the front surface facing upward.

2. Check seat track position sensor circuit (Short to GND/Battery).



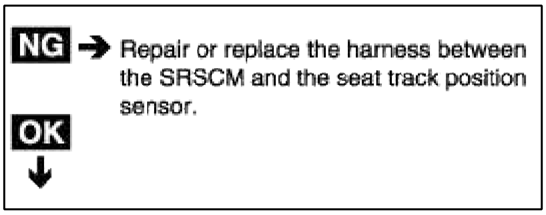


[CHECK]

Measure the voltage and resistance of the seat track position sensor high and body ground between the SRSCM connector and the seat track position sesnor connector.

Resistance : ∞

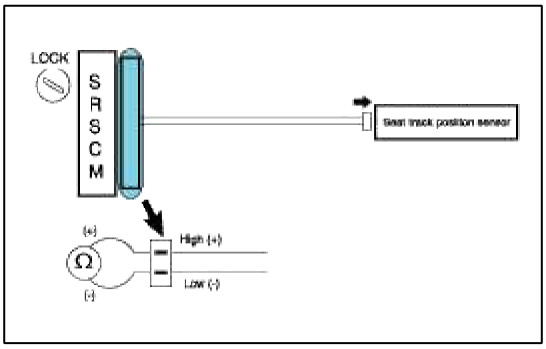
Voltage : 0 V



NG ➔ Repair or replace the harness between the SRSCM and the seat track position sensor.

OK
↓

3. Check the seat track position sensor.

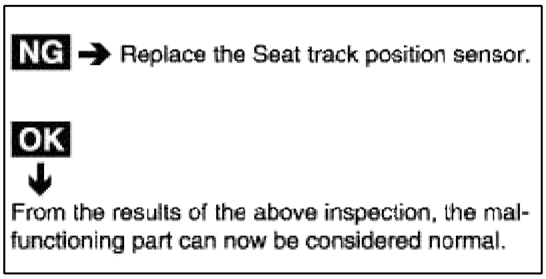

LOCK
S
R
S
C
M
Seat track position sensor
(+)
Ω
(-)
High (+)
Low (-)

[CHECK]

Check the resistance.

SWITCH OPEN : R = 900Ω ± 10% (Backward : over 5 clicks)

SWITCH CLOSED : R = 300Ω ± 10% (Forward : within 5 clicks)

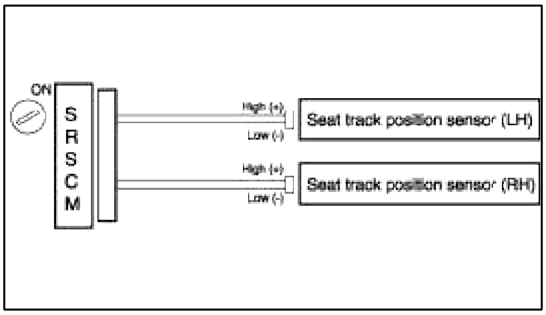


NG ➔ Replace the Seat track position sensor.

OK
↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

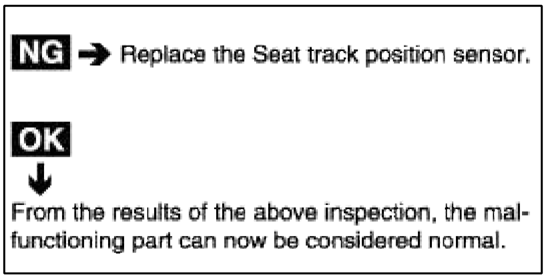
4. Check the seat track position sensor. (Defect)
   A. Turn the ignition switch to LOCK.
   B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
   C. Connect the seat track position sensor connector.
   D. Connect the negative (-) terminal cable to the battery, and wait for 30 seconds.


ON
S
R
S
C
M
High (+)
Low (-)
Seat track position sensor (LH)
High (+)
Low (-)
Seat track position sensor (RH)

   A. Turn the ignition switch to ON, and wait for at least 30 seconds.
   B. Clear the malfunction code stored in the memory of the Hi-Scan Pro.
   C. Turn the ignition switch to LOCK, and wait for 30 seconds.
   D. Turn the ignition switch to ON, and wait for 30 seconds.
   E. Using the Hi-Scan Pro, check for DTCs.
      There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this check.



NG ➔ Replace the Seat track position sensor.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

Restraint > Troubleshooting > B1395

CIRCUIT INSPECTION (DUAL STAGE AIRBAG)

DTC	B1395 Firing loop interconnection fault B1620 Internal fault B1650 Crash recorded (Frontal airbag) B1651 Crash recorded (Driver side airbag) B1652 Crash recorded (Passenger side airbag) B1657 Crash recorded (Belt pretensioner only) B1670 2nd stage crash recorded (Frontal airbag)

CIRCUIT DESCRIPTION

1. Condition of the firing circuit activation transistors.
2. Adequacy of deployment energy reserves.
3. Safing sensor integrity. (detection of faulty closure)
4. Plausibility of the accelerometer signal.
5. Operation of the SRSCM components.

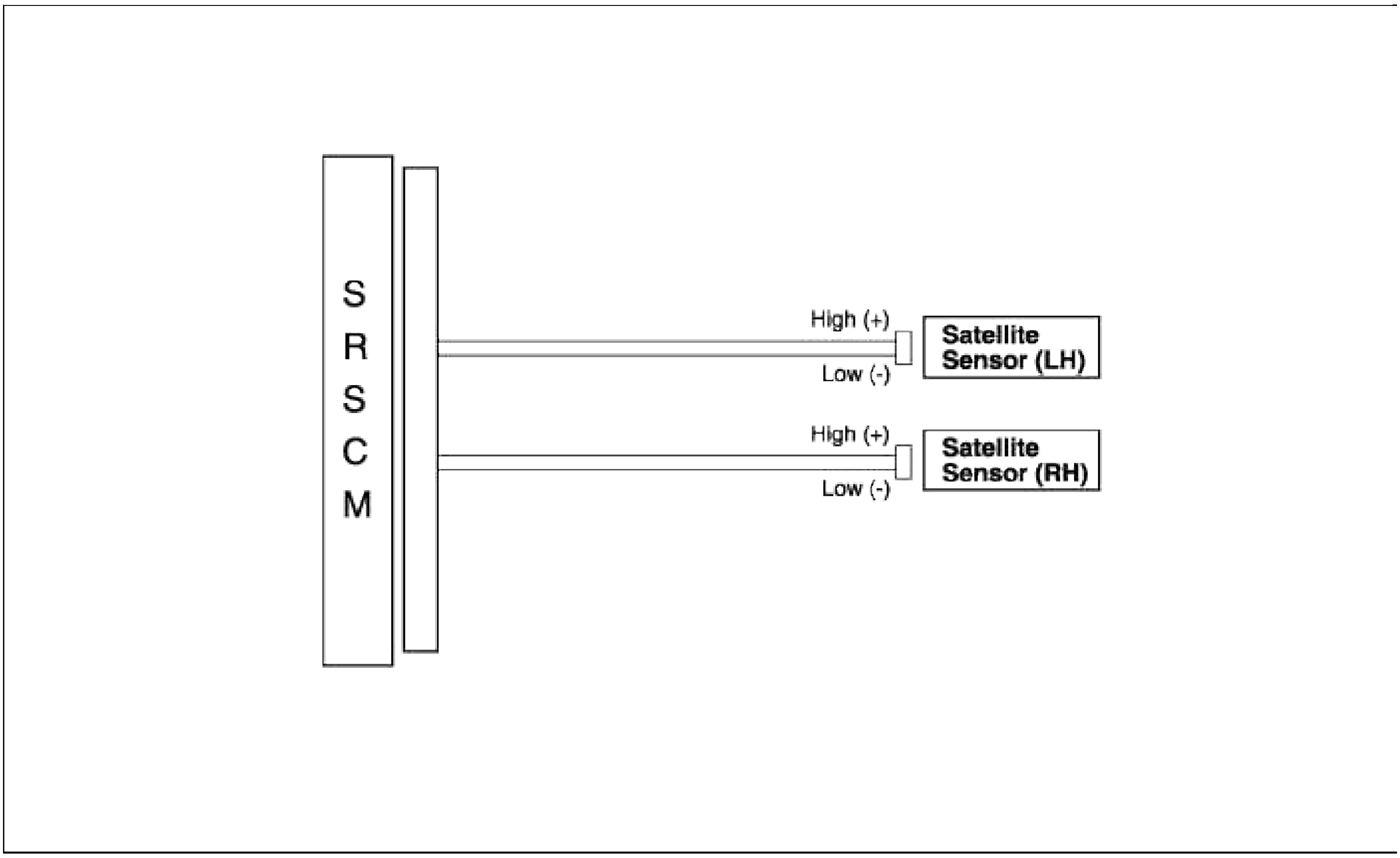
Restraint > Troubleshooting > B1400

CIRCUIT INSPECTION (DUAL STAGE AIRBAG)

DTC	B1400 Satellite sensor left side defect B1403 Satellite sensor right side defect B1409 Satellite sensor left communication error B1410 Satellite sensor right communication error B1414 Satellite sensor left side wrong ID B1415 Satellite sensor right side wrong ID

CIRCUIT DESCRIPTION

WIRING DIAGRAM

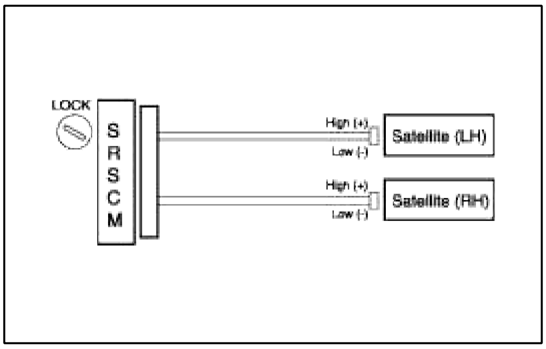

SRSCM
High (+)
Low (-)
Satellite Sensor (LH)
High (+)
Low (-)
Satellite Sensor (RH)

INSPECTION PROCEDURE

1. Preparation
   - (1) Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.
   - (2) Remove the DAB module.
   - (3) Disconnect the connectors of the PAB, left and right side airbags, belt pretensioners and satellite sensors.
   - (4) Disconnect the SRSCM connector.

> CAUTION
>
> Place the DAB with the front surface facing upward.

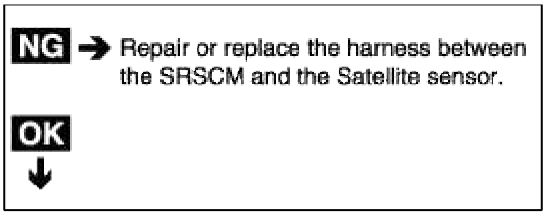
2. Check sensor Satellite circuits (Communication error).


LOCK
SRSCM
High (+)
Low (-)
Satellite (LH)
High (+)
Low (-)
Satellite (RH)

[PREPARATION]

Check sensor continuity between sensor SRSCM connector and both satellite connector's high (+) and low (-) sides.

OK : Continuity

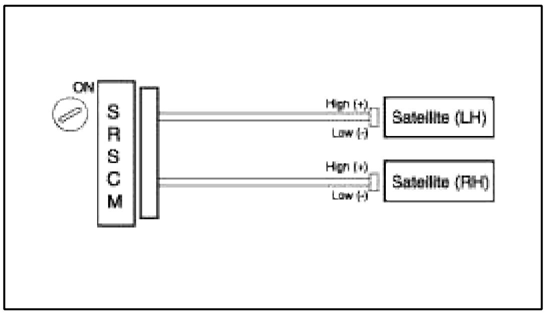


NG ➔ Repair or replace the harness between the SRSCM and the Satellite sensor.

OK

↓

3. Check the Satellite sensor (Defect).
   - A. Turn the ignition switch to LOCK.
   - B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
   - C. Connect the satellite connector.
   - D. Connect the negative (-) terminal cable to the battery, and wait for 30 seconds.

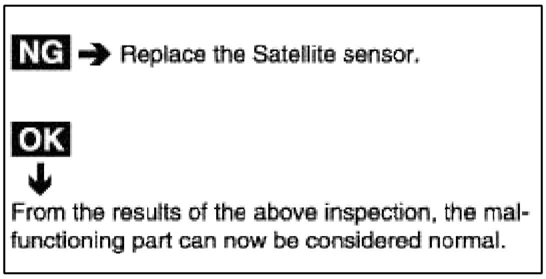


- A. Turn the ignition switch to ON, and wait for at least 30 seconds.
- B. Clear the malfunction code stored in the memory of the Hi-Scan Pro.
- C. Turn the ignition switch to LOCK, and wait for 30 seconds.
- D. Turn the ignition switch to ON, and wait for 30 seconds.
- E. Using the Hi-Scan Pro, check for DTCs.

There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this check.



NG ➔ Replace the Satellite sensor.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

Restraint > Troubleshooting > B1511

CIRCUIT INSPECTION (DUAL STAGE AIRBAG)

DTC	B1511 Driver seat buckle switch open/short to Battery B1512 Driver seat buckle switch short to GND B1513 Passenger seat buckle swithch open/short to Battery B1514 Passenger seat buckle swithch short to GND B1515 Driver seat buckle switch defect B1516 Passenger seat buckle switch defect

CIRCUIT DESCRIPTION

INSPECTION PROCEDURE

1. Preparation
    (1) Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.

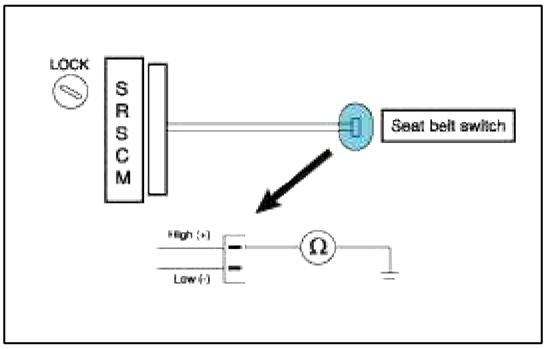
    (2) Remove the DAB module.

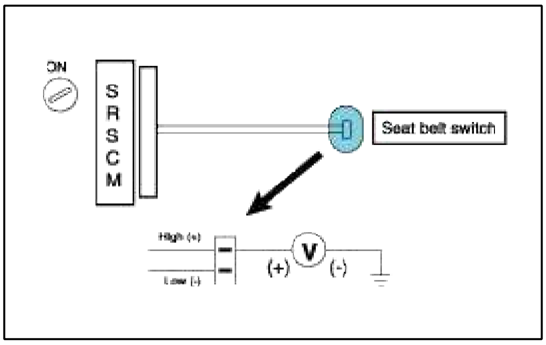
    (3) Disconnect the connectors of the PAB, left and right side airbags, belt pretensioners and satellite sensors.

    (4) Disconnect the connector of theSRSCM.

> CAUTION
>
> Place the DAB with the front surface facing upward.

2. Check buckle switch sensor circuit (Short to GND/Battery).



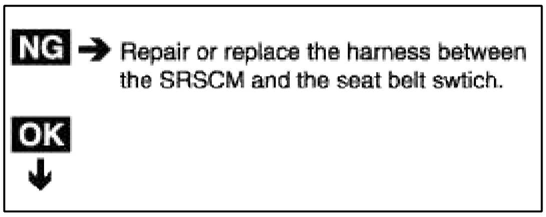


[CHECK]

Measure the voltage and resistance of the seat track position sensor high and body ground between the SRSCM connector and the seat track position sesnor connector.

Resistance : ∞

Voltage : 0 V

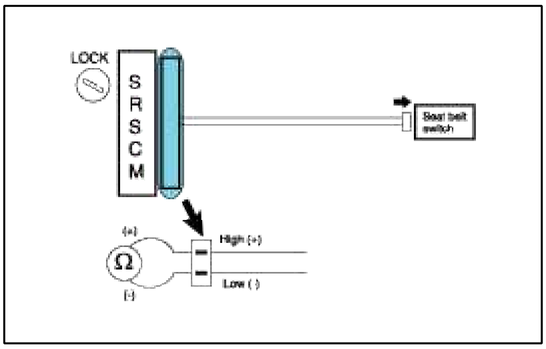


NG ➔ Repair or replace the harness between the SRSCM and the seat belt swtich.

OK

↓

3. Check the seat belt switch.

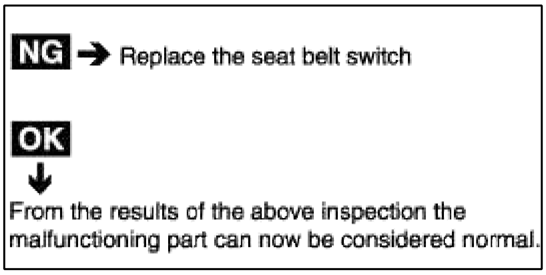


[CHECK]

Check the resistance with the switch on and off.

SWITCH OPEN : R = 4KΩ ± 10% (Belted)

SWITCH OPEN : R = 1KΩ ± 10% (Unbelted)



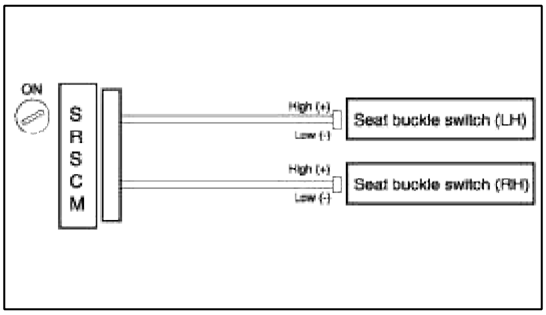
NG ➔ Replace the seat belt switch

OK

↓

From the results of the above inspection the malfunctioning part can now be considered normal.

4. Check the seat buckle switch (Defect).
   - A. Turn the ignition switch to LOCK.
   - B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
   - C. Connect the seat buckle switch connector.
   - D. Connect the negative (-) terminal cable to the battery, and wait for 30 seconds.

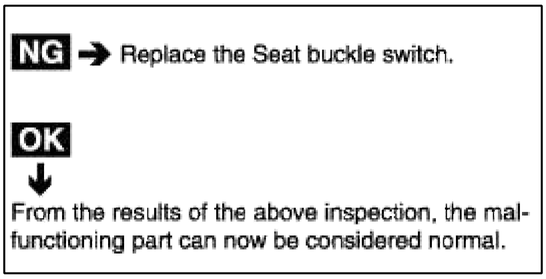


- A. Turn the ignition switch to ON, and wait for at least 30 seconds.
- B. Clear the malfunction code stored in the memory of the Hi-Scan Pro.
- C. Turn the ignition switch to LOCK, and wait for 30 seconds.
- D. Turn the ignition switch to ON, and wait for 30 seconds.
- E. Using the Hi-Scan Pro, check for DTCs.

There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this check.



NG ➔ Replace the Seat buckle switch.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

Restraint > Troubleshooting > B1620

CIRCUIT INSPECTION (SRE-LC)

DTC	B1620 Internal fault B1650 Crash recorded (Frontal-Replace SRSCM) B1661 Parameter configuration missing/incorrect

CIRCUIT DESCRIPTION

1. Condition of the firing circuit activation transistors.
2. Adequacy of deployment energy reserves.
3. Safing sensor integrity. (detection of faulty closure)
4. Plausibility of the accelerometer signal.
5. Operation of the SRSCM components.

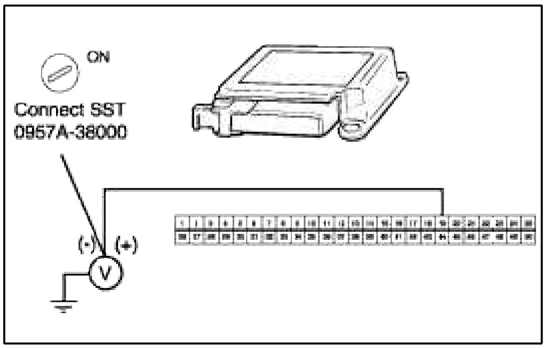
Restraint > Troubleshooting > B2500

CIRCUIT INSPECTION (SRE-LC)

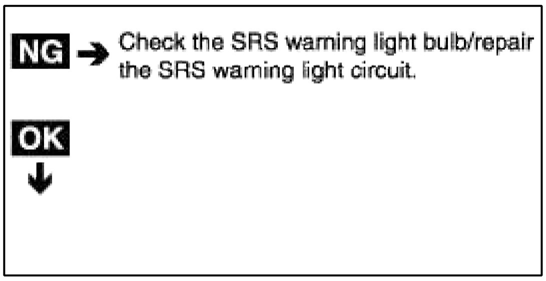
DTC	B2500 Warning lamp failure

INSPECTION PROCEDURE

1. Check the fuse.
   - A. Remove fuse airbag fuse and airbag warning lamp fuse from the junction block.
   - B. Inspect the state of the fuses.
   - C. Replace if necessary.
2. Check the SRS warning lamp circuit.
   - A. Connect the negative (-) terminal cable to the battery.
   - B. Turn the ignition switch to ON.



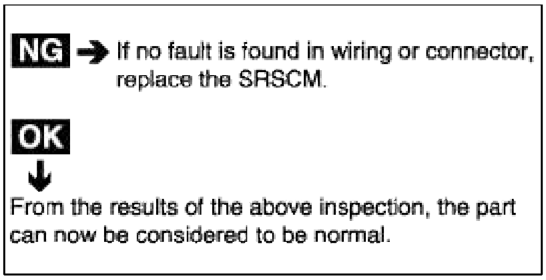
   - A. Measure voltage at the harness side connector of the SRSCM.
     Voltage: 9-16 V



NG → Check the SRS warning light bulb/repair the SRS warning light circuit.

OK ↓

   - B. Check the SRS SRI (Service Reminder Indicator).
     OK: SRS SRI ON


NG ➔ If no fault is found in wiring or connector, replace the SRSCM.

OK

↓

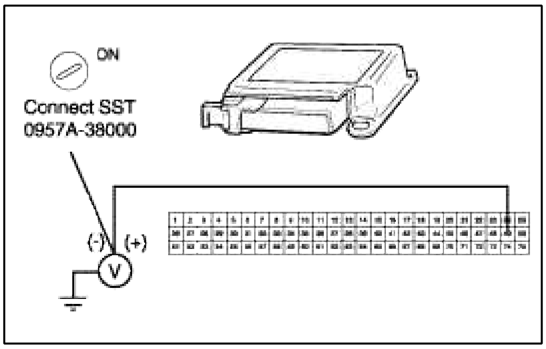
From the results of the above inspection, the part can now be considered to be normal.

CIRCUIT INSPECTION (DUAL STAGE AIRBAG)

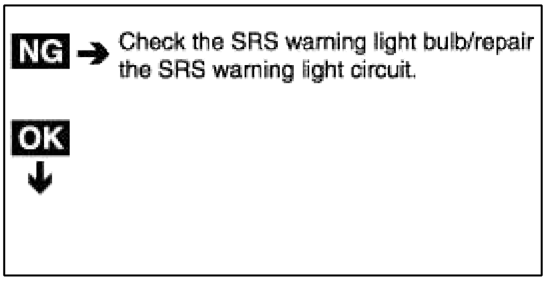
DTC	B2500 Warning lamp failure B2502 Passenger deactivation lamp failure

INSPECTION PROCEDURE

1. Check the fuse.
   A. Remove fuse airbag fuse and airbag warning lamp fuse from the junction block.
   B. Inspect the state of the fuses.
   C. Replace if necessary.
2. Check the SRS warning lamp circuit.
   A. Connect the negative (-) terminal cable to the battery.
   B. Turn the ignition switch to ON.



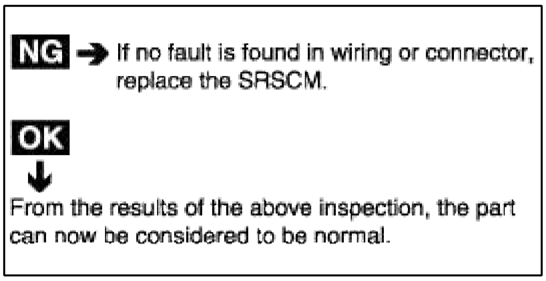
   A. Measure voltage at the harness side connector of the SRSCM.
      Voltage : 10-16.5 V


NG ➔ Check the SRS warning light bulb/repair the SRS warning light circuit.

OK

↓

   B. Check the SRS SRI (Service Reminder Indicator).
      OK : SRS SRI ON


NG ➔ If no fault is found in wiring or connector, replace the SRSCM.

OK

↓

From the results of the above inspection, the part can now be considered to be normal.

ACCENT(LC) > 2002 > G 1.5 SOHC > Steering System

Steering System > General Information > General Information

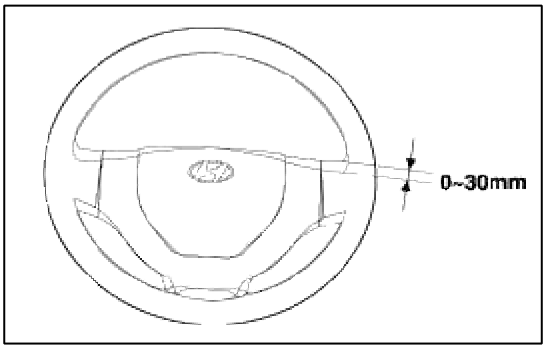
GENERAL

CHECKING STEERING WHEEL FREE PLAY

1. Start the engine with the steering wheel in the straight ahead position.
2. Measure the play at the circumference of the steering wheel.

Standard value

Steering wheel free play : 0~30 mm (0~1.1 in.)



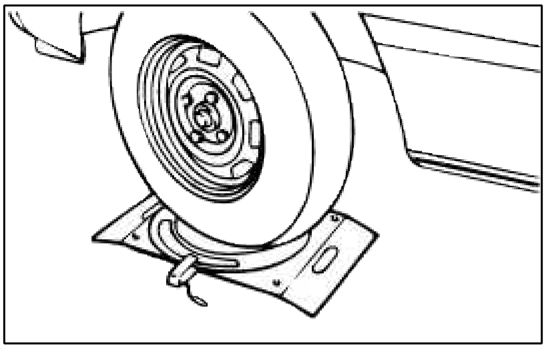
3. If the play exceeds the standard value, inspect the connection between the steering shaft and steering linkage.

CHECKING STEERING ANGLE

1. Place the front wheel on a turning radius gauge and measure the steering angle.

Standard value

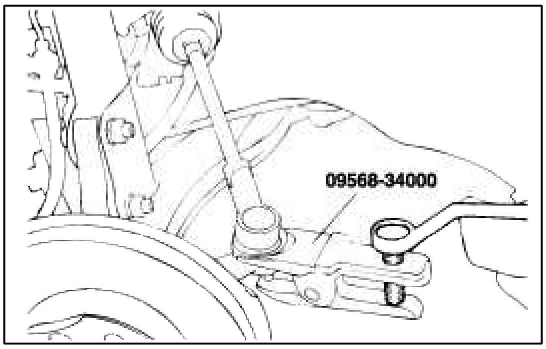
Wheel angle (Unladen state)
Inner wheel : 37°37′ ± 1°30′
Outer wheel : 31°51′



2. If the measured value is not within the standard value, adjust the toe and inspect again.

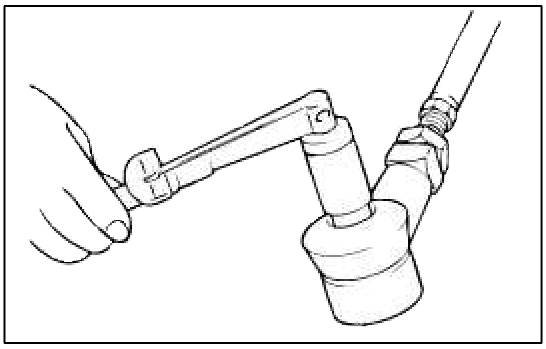
CHECKING THE TIE ROD END BALL JOINT STARTING TORQUE

1. Disconnect the tie rod and knuckle by using the special tool.



2. Move the ball joint stud in a circular motion several times to check for looseness.
3. Mount the nuts on the ball joint, and then measure the ball joint starting torque.

Standard value
0.5~2.5 Nm (5~25 kg·cm, 0.36~1.78 lb·ft)



4. If the starting torque exceeds the upper limit of the standard value, replace the tie rod end.
5. Even if the starting torque is below the lower limit of the standard value, check the play of the ball joint and replace if necessary.

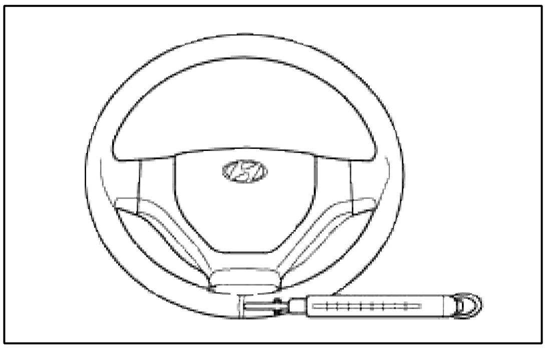
CHECKING STATIONARY STEERING EFFORT

1. Position the vehicle on a level surface and place the steering wheel in the straight ahead position.
2. Increase the engine speed to 1000 ± 100 rpm.

> NOTE
>
> After checking, reset the engine speed to the standard value (idling speed).

3. Measure the turning force with a spring scale by turning the steering wheel clockwise and counterclockwise one and a half turns.

Standard value
Stationary steering effort : 34.3N (3.5 kg, 7.8 lbs)



4. Check that there is no sudden change of force while turning the steering wheel.
5. If the stationary steering effort is excessive, check and adjust the following points.
   (1) Damage or cracks on the dust cover and tie rod end ball joint.
   (2) Pinion preload of the steering gear box and starting torque of the tie rod end ball joint.
   (3) Starting torque of the ball joint.

CHECKING STEERING WHEEL RETURN

1. The force required to turn the steering wheel and the wheel return should be the same for both left and right in case of moderate or sharp turns.

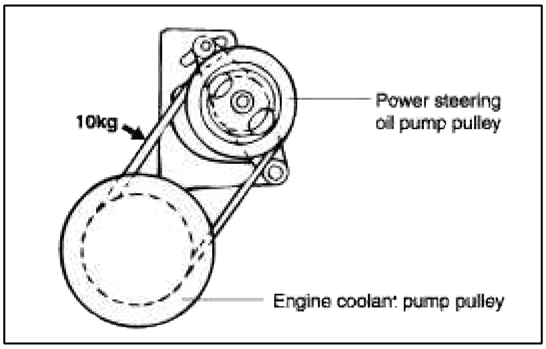
2. When the steering wheel is turned 90° and held for a couple of seconds while the vehicle is being driven at 35kph, the steering wheel should return at least 70° from the neutral position when it is released.

> **NOTE**
>
> If the steering wheel is turned very quickly, steering may be momentarily difficult. This is not a malfunction because the oil pump output will be somewhat decreased.

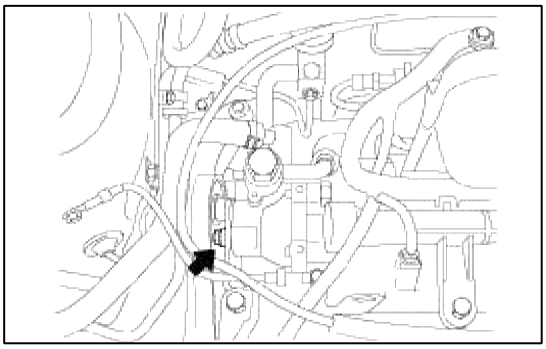
CHECKING POWER STEERING BELT TENSION

1. Press the V belt, applying a pressure of 98N (10kg, 22lb) at the specified point and measure the deflection to confirm that it is within the standard value.

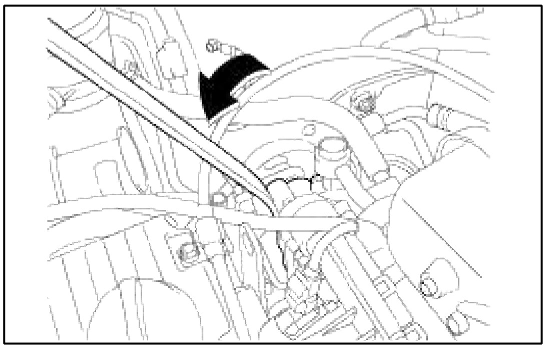
Standard value
V belt deflection : 7~10 mm



2. If the belt deflection is beyond the standard value, adjust the belt tension as follows.
   (1) Loosen the bolt adjusting the power steering "V" belt tension.



   (2) Put a bar or equivalent between the bracket and the oil pump and adjust the tension so that the belt deflection is within the standard value.



   (3) Tighten the bolt adjusting the power steering "V" belt tension.
   (4) Check the belt deflection and adjust it again if necessary.

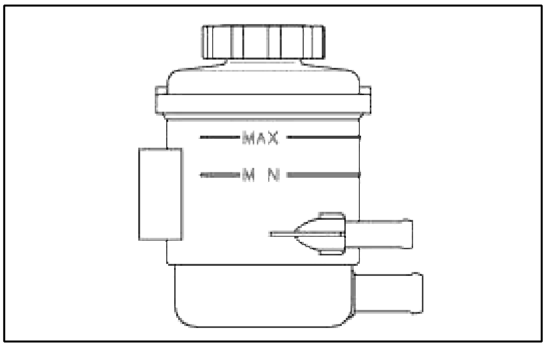
> **CAUTION**
>
> After turning the V belt in the normal rotation direction more than once, recheck the belt deflection.

CHECKING POWER STEERING FLUID LEVEL

1. Position the vehicle on a level surface.
2. Start the engine. With the vehicle kept stationary, turn the steering wheel several times continuously to raise the fluid temperature to 50~60°C (122 to 140°F).
3. With the engine at idle, turn the steering wheel fully clockwise and counterclockwise several times.
4. Make sure there is no foaming or cloudiness in the reservoir fluid.
5. Stop the engine to check for any difference in fluid level between a stationary and a running engine.

NOTE

1. If the fluid level varies 5 mm (0.2 in.) or more, bleed the system again.
2. If the fluid level suddenly rises after stopping the engine, further bleeding is required.
3. Incomplete bleeding will produce a chattering sound in the pump and noise in the flow control valve, and lead to decreased durability of the pump

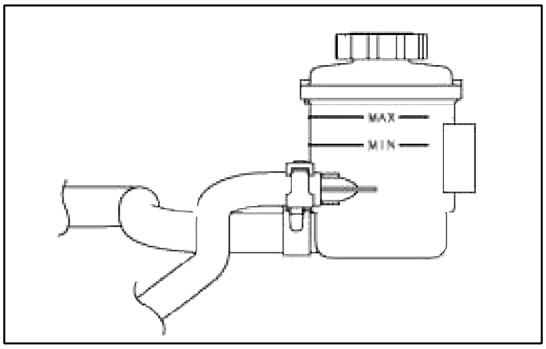


REPLACING POWER STEERING FLUID

1. Jack up the front wheels and support them with rigid racks.
2. Disconnect the return hose from the oil reservoir and plug the oil reservoir.
3. Connect a vinyl hose to the disconnected return hose, and drain the oil into a container.
4. Disconnect the high-tension cable at the ignition coil side.
   While operating the starter motor intermittently, turn the steering wheel all the way to the left and then to the right several times to drain the fluid.
5. Connect the return hose and fix it with a clip securely.
6. Fill the power steering fluid reservoir with the specified fluid.

PSF-3 : 0.9 lit. (0.95 qts.)

7. Start the engine.
   Check for fluid leaks from the hose, then stop the engine.
8. Pour the fluid into the bottom of the oil filter in the power steering fluid reservoir.
9. Bleed the air.



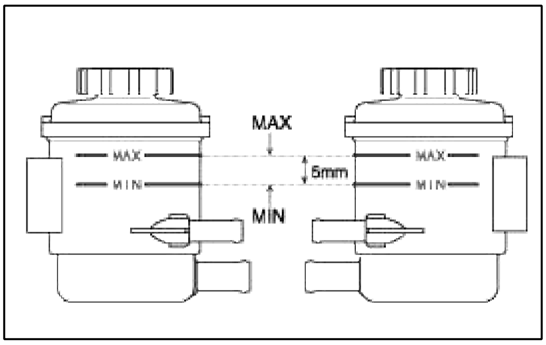
AIR BLEEDING

1. Disconnect the ignition coil high tension cable, and then, while operating the starter motor intermittently (for 15 to 20 seconds), turn the steering wheel all the way to the left and then to the right five or six times.

> **NOTE**
>
> 1. During air bleeding, replenish with the fluid so that the level does not fall below the lower position of the filter.
> 2. If air bleeding is done while the vehicle is idling, the air will be broken up and absorbed into the fluid. Be sure to do the bleeding only while cranking.

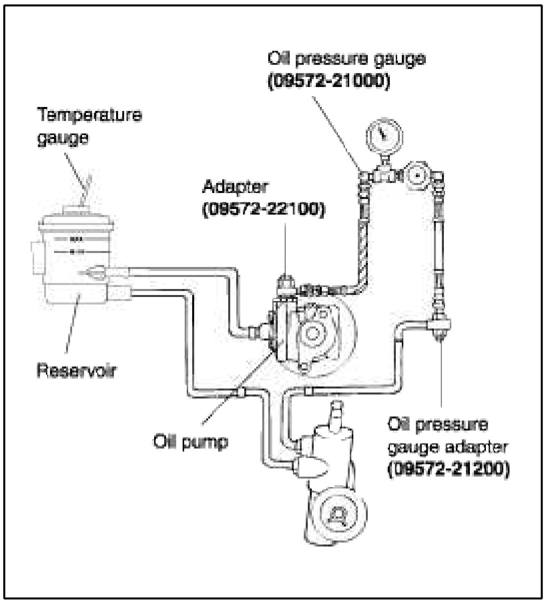
2. Connect the high tension cable, and then start the engine (idling).
3. Turn the steering wheel to the left and then to the right, until there are no air bubbles in the oil reservoir.
4. Confirm that the fluid is not milky and that the level is between "MAX" and "MIN" marks on the reservoir.
5. Check that there is a little change in the fluid level when the steering wheel is turned left and right.

> **NOTE**
>
> 1. If the fluid level varies 5mm (0.2 in.) or more, bleed the system again.
> 2. If the fluid level suddenly rises after stopping the engine, further bleeding is required.
> 3. Incomplete bleeding will produce a chattering sound in the pump and noise in the flow control valve, and lead to decreased durability of the pump.



OIL PUMP PRESSURE TEST

1. Disconnect the pressure hose from the pump. Connect the special tool between the pump and the pressure hose as illustrated.



2. Bleed the air, and then start the engine and turn the steering wheel several times so that the fluid temperature can rise to approximately 50-60°C (122-132°F) operating temperature.
3. Increase the engine speed to 1,000 ± 100 rpm.

4. Close the shut-off valve of the special tool and measure the fluid pressure to confirm that it is within the standard value range.

Standard value
Relief pressure :
5.9 MPa (60 kg·cm², 853 psi)

CAUTION

Do not keep the shut-off valve on the pressure gauge closed for more than ten seconds.

5. If the fluid pressure is not within the standard value range, overhaul the oil pump.
6. Remove the special tools, and tighten the pressure hose to the specified torque.

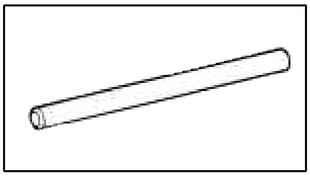
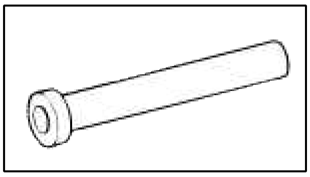
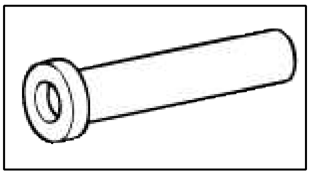
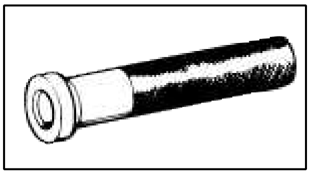
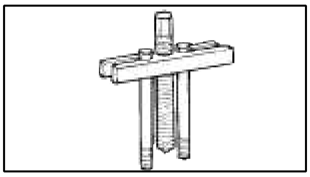
Tighteninq torque
55~65 Nm (550~650 kg·cm, 40.6~47.9 lb·ft)

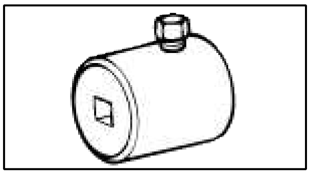
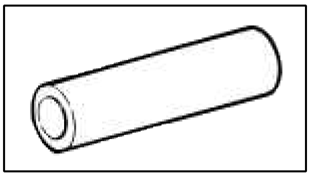
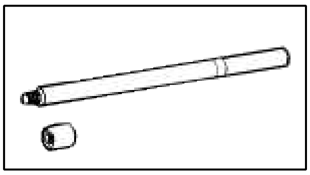
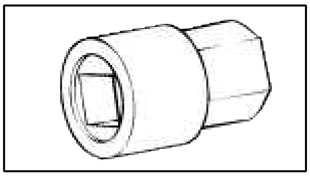
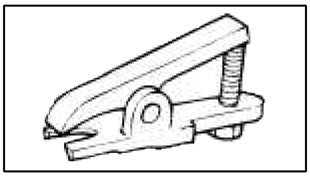
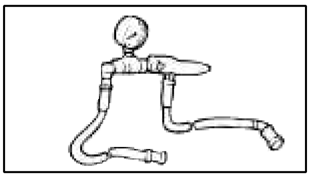
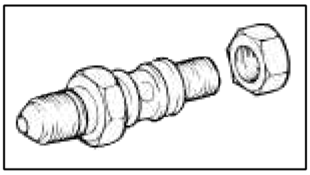
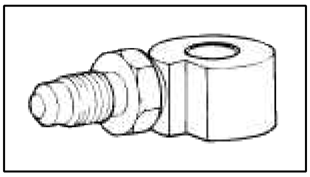
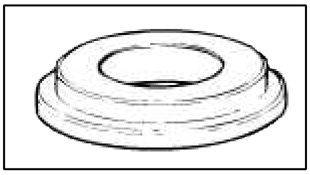
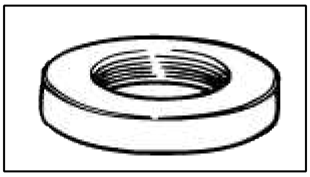
---

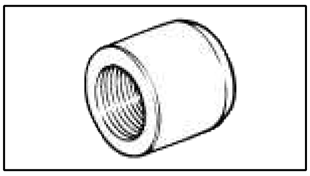
7. Bleed the system.

Steering System > General Information > Special Service Tools

SPECIAL TOOLS

Tool (Number and name)	Illustration	Use
09517-21400 Drift		Removal of pinion gear bearing
09222-21100 Valve stem oil seal installer		Installation of the pinion gear bearing
09432-21600 Bearing installer		Installation of oil pump oil seal.
09434-14200 Counter shaft bearing installer		Installation of the valve housing oil seal.
09561-11002 Steering wheel puller		Removal of the steering wheel

09565-11100 Preload socket		Measurement of the mainshaft pre-load.
09565-21000 Pinion bearing remover and installer		Removal & installation of pinion gear bearing and oil seal valve body housing.
09555-21000 Bar		Removal & installation of the oil seal from gear housing.
09565-21100 Yoke plug torque wrench socket		Removal, installation and adjustment of steering gear yoke plug.
09568-34000 Ball joint		Separation of the tie rod end ball joint.
09572-21000 Oil pressure gauge		Measurement of the power steering oil pressure. (use with 09572-21200, 09572-22100)
09572-21200 Oil pressure gauge adapter (Hose side)		Measurement of the power steering oil pressure. (use with 09572-21000, 09572-22100)
09572-22100 Oil pressure gaug adapter		Measurement of the power steering oil pressure. (use with 09572-21000, 09572-21200)
09573-21000 Oil seal installer guide		Installation of the oil seal (use with 09573-21100, 09573-21200, 09517-11000, 09555-21000)
09573-21100 Oil seal installer		Installation of the back-up washer and oil seal (use with 09573-21000, 09573-21200, 09555-21000)

09573-21200 Oil seal guide		1. Removal of gear box oil seal and back washer. (use with 09555-21000) 2. Installation of gear box oil seal and back washer. (use with 09555-21000, 09573-21000).

Steering System > General Information > Troubleshooting

TROUBLESHOOTING (POWERSTEERING)

Symptom	Probable cause	Remedy
Excessive play in steering wheel	Loose yoke plug Loose steering gear mounting bolts Loose or worn tie rod end	Retighten Retighten Retighten or replace as necessary
Steering wheel operation is not smooth (Insufficient power assist)	Drive slippage Damaged Drive belt Low fluid level Air in the fluid Twisted or damaged hoses Insufficient oil pump pressure Sticky flow control valve Excessive internal oil pump leakage Excessive oil leaks from rack and pinion in gear box Distorted or damaged gear box or valve body seals	Check Replace Replenish Bleed air Correct the routing or replace Repair or replace the oil pump Replace Replace the damaged parts Replace the damaged parts Replace
Steering wheel does not return properly	Excessive turning resistance of tie-rod end Excessively tightened rack support cover Inner tie rod and/or ball joint cannot turn smoothly Loose mounting of gear box mounting bracket Worn steering shaft joint and/or body grommet Distorted rack Damaged pinion bearing Twisted or damaged hoses Damaged oil pressure control valve Damaged oil pump input shaft bearing	Replace Adjust Replace Retighten Correct or replace Replace Replace Reposition or replace Replace Replace
Noise	**Hissing Noise in Steering Gear** There is some noise with all power steering systems. One of the most common is a hissing sound when the steering wheel is turned and the car is not moving.This noise will be most evident then turning the wheel while the brakes are being applied. There is no relationship between this noise and steering performance. Do not replace the valve unless the "hissing" noise becomes extreme. A replaced valve will also make a slight noise, and is not always a solution for the condition.	

Rattling or chucking noise in the rack and pinion	Interference with hoses from vehicle body Loose gear box bracket Loose tie rod end and/or ball joint Worn tie rod and/or ball joint	Reposition Retighten Retighten Replace
Noise in the oil pump	Low fluid level Air in the fluid Loose pump mounting bolts	Replenish Bleed air Retighten

NOTE

A slight "grinding noise" may be heard immediately after the engine is started in extremely cold whether conditions (below-20°C) : This is due to power steering fluid characteristics in extreme cold conditions and is not an indication of malfunction.

TROUBLESHOOTING (MANUAL STEERING)

Symptom	Probable cause	Remedy
Excessive play in steering wheel	Loose rack support cover Loose steering gear mounting bolts Loose or worn tie-rod end	Retighten Retighten Retighten or replace as necessary
Steering wheel operation is hard	Excessive turning resistance of tie-rod ball joint Excessively tightened rack support cover Inner tie rod and/or ball joint cannot turn smoothly Distorted rack Worn steering shaft joint and/or body grommet Damaged pinion bearing	Replace Adjust Lubricate or replace ball joint Replace Replace Replace
Steering wheel does not return properly	Excessive turning resistance of tie-rod ball joint Excessively tightened rack support cover Inner tie rod and/or ball joint cannot turn smoothly Worn steering shaft joint and/or body grommet Distorted rack Damaged pinion bearing	Replace Adjust Replace Correct or replace Replace Replace

Steering System > General Information > Specifications

SPECIFICATIONS

Item	Specification
Manual steering	
Shaft and joint type	Collapsible, cross joints (two joints used)
Steering gear type	Rack and pinion
Rack stroke	134mm (lock to lock : 3.87 turns)
Power steering	
Shaft and joint type	Collapsible, cross joints, tilt column with pop-up
Steering gear type	Rack and pinion
Rack stroke	134mm (lock to lock : 2.93 turns)
Oil pump type	Vane type
Oil pump displacement	9.6cm^3/rev. (0.59 in^3/rev.)
Oil pump pressure switch operating pressure	1.5-2.0 MPa (15-20 kg/cm^2, 213-284 psi)

SERVICE STANDARD

Item	Specification
Manual steering	
Steering wheel free play	0-30 mm (0-1.1 in.)
Steering angle	
Inner wheel	37°37′ ± 1°30′
Outer whel	31°51′
Tie rod end ball joint starting torque	0.5-2.5 Nm (5-25 kg·cm, 0.4-1.8 lb·ft)
Total pinion preload	
±180° or less from neutral	0.4-1.1 Nm (4-11 kg·cm, 0.3-0.8 lb·ft)
±180° or more from neutral	0.3-1.6 Nm (3-16 kg·cm, 0.2-1.2 lb·ft)
Tie rod swing resistance	2-5 Nm (20-50 kg·cm, 1.4-3.6 lb·ft)
Power steering	
Steering wheel free play	0-30 mm (0-1.1 in.)
Steering angle	
Inner wheel	37°37′ ± 1°30′
Outer wheel	31°51′
Stationary steering effort	34.3 N (3.5 kg, 7.8 lbs) or less
Belt deflection [under 98N (10kg, 22lb) force]	7-10 mm
Oil pump relief pressure	5.9MPa (60 kg/cm^2, 853 psi)
Total pinion preload	0.6-1.3 Nm (6-13 kg·cm, 0.4-1.0 lb·ft.)
Tie rod swing resistance	2-5 Nm (20-50 kg·cm, 1.4-3.6 lb·ft)

TIGHTENING TORQUE

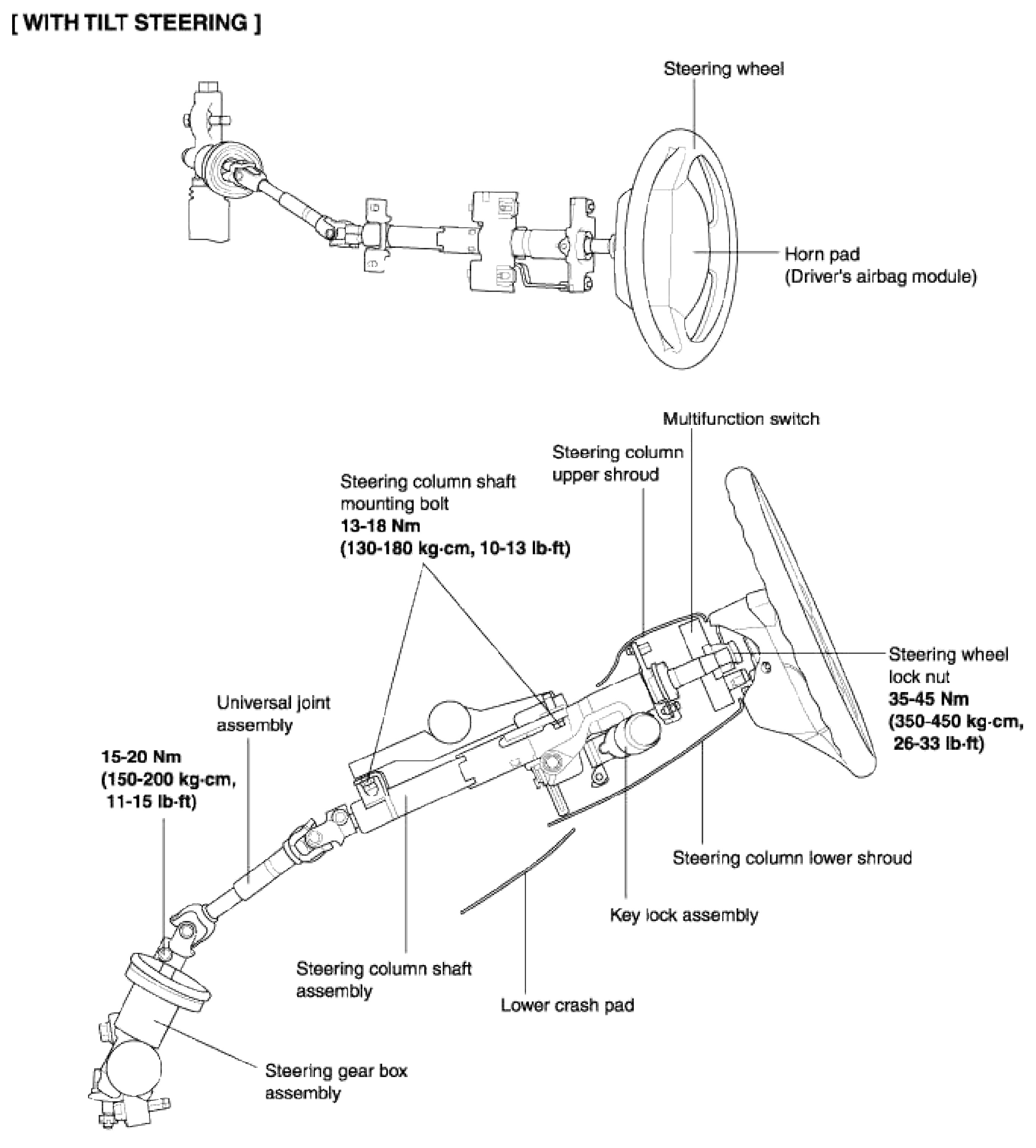
Item	Nm	kg·cm	lb·ft
Steering wheel lock nut	35-45	350-450	26-33
Steering column and shaft assembly	13-18	130-180	10-13
mounting bracket	15-20	150-200	11-15
Steering shaft and joint	15-20	150-200	11-15
Pinion gear and joint	4-6	40-60	3-4.4
Dust cover mounting bolt	60-80	600-800	44-59
Gear box mounting bolt	50-55	500-550	37-41
Tie rod end lock nut	16-34	160-340	12-25
Tie rod ball joint slotted nut	50-70	500-700	37-52
Rack yoke plug nut	80-100	800-1000	59-74
Tie rod to rack			
Power Steering Only			
Valve body housing to rack housing	20-30	200-300	15-22
assembly	8-12	80-120	6-9
Pressure and return tube mounting clip	12-18	120-180	9-13
Pressure and return tube to gear box	20-30	200-300	15-22
Pinion and return valve assembly to self-	50-70	500-700	37-52
locking nut	20-27	200-270	15-20
End plug	25-33	250-330	18-24
Oil pump mounting bracket bolt	65-75	650-750	47.9-54.2
Oil pump adjusting bolt	9-14	90-140	7-10
Pressure hose mounting bolt (to oil	3-5	30-50	2.2-3.6
pump)			
Oil reservoir mounting bolt	4-6	40-60	3-4.4
Suction hose mounting clamp			
(to oil pump suction connector)			
Oil cooler tube mounting bolt			

LUBRICANTS

Item	Recommended lubricant	Quantity
Horn contact ring of steering wheel	LONG TIME PD2 (OPTIMOL, GERMAN)	As required
Bearing of steering shaft	ALVANIA #2 or #3 (KEUK DONG SHELL, KOREA)	As required
Ball joint of tie rod end	VALIANT R-2 (SHOSEK I, JAPAN)	As required
Steering gear housing	ONE-LUBER RP (KYODOYUSHI, JAPAN)	As required
Inner ball joint of gear box	LONG TIME PD2 (OPTIMOL, GERMAN)	As required
Contact area of gear box bellows & tie rod	SILICON GREASE	As required
Power steering fluid	PSF-3 TYPE	0.9 liter (0.5 qts.)

Steering System > Steering Column & Shaft > Steering Column/Shaft > Components and Components Location

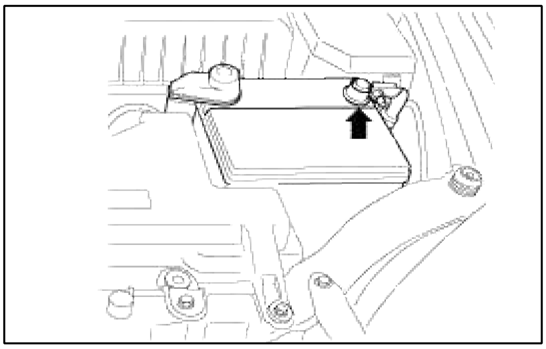
COMPONENTS


[WITH TILT STEERING]
Steering wheel
Horn pad
(Driver's airbag module)
Multifunction switch
Steering column
upper shroud
Steering column shaft
mounting bolt
13-18 Nm
(130-180 kg·cm, 10-13 lb·ft)
Steering wheel
lock nut
35-45 Nm
(350-450 kg·cm,
26-33 lb·ft)
Universal joint
assembly
15-20 Nm
(150-200 kg·cm,
11-15 lb·ft)
Steering column lower shroud
Key lock assembly
Steering column shaft
assembly
Lower crash pad
Steering gear box
assembly

Steering System > Steering Column & Shaft > Steering Column/Shaft > Repair procedures

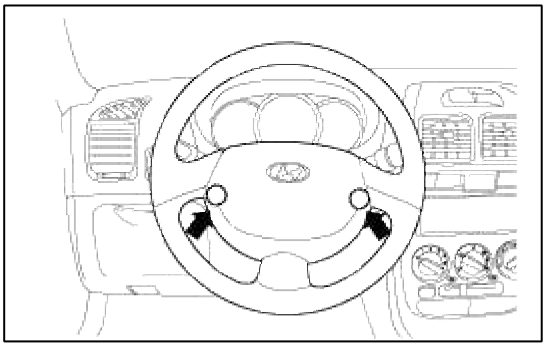
REMOVAL

1. Disconnect the (-) negative terminal from the battery.

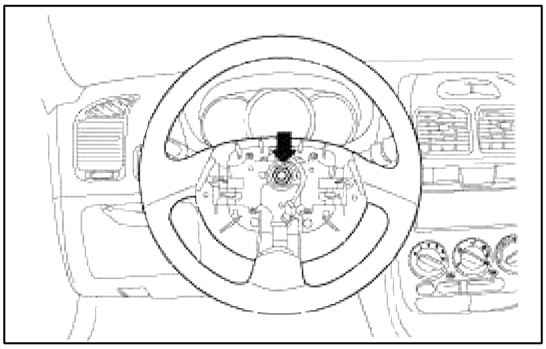


2. After removing the bolts in the illustration, remove the driver's airbag module.

> **NOTE**
>
> For the vehicles not equipped with SRS airbag, remove the horn cover assembly.

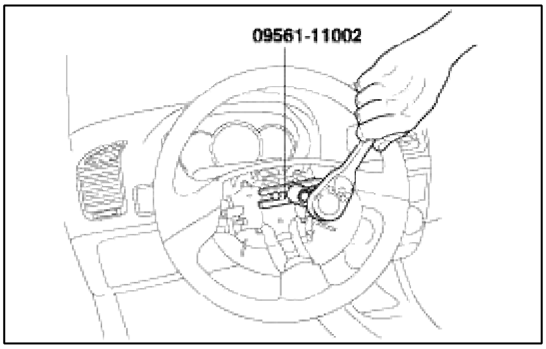


3. Remove the steering wheel lock nut.

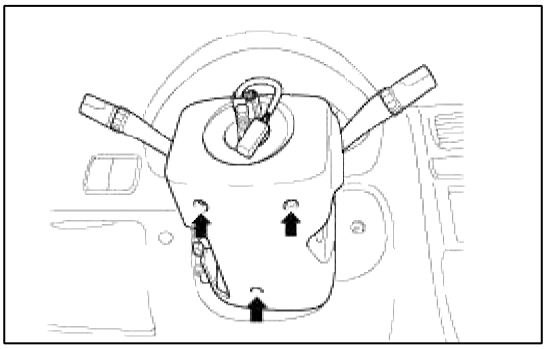


4. After aligning the marks on the steering shaft and wheel, remove the steering wheel using the special tool.

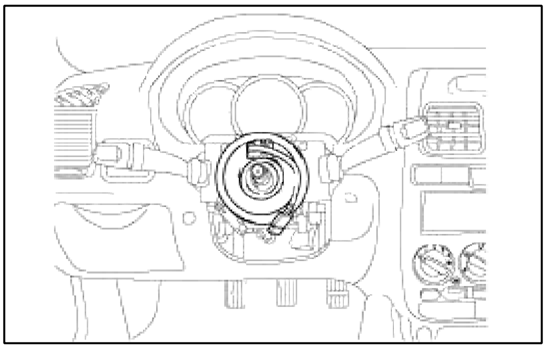
> **NOTE**
>
> Do not hammer on the steering wheel to remove it, doing so may damage the steering column.



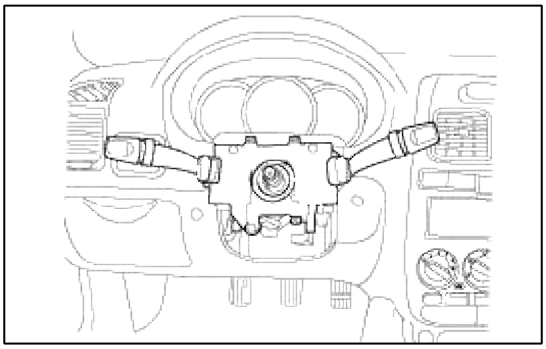
5. After removing the 3 bolts in the illustration, remove the steering column shroud.



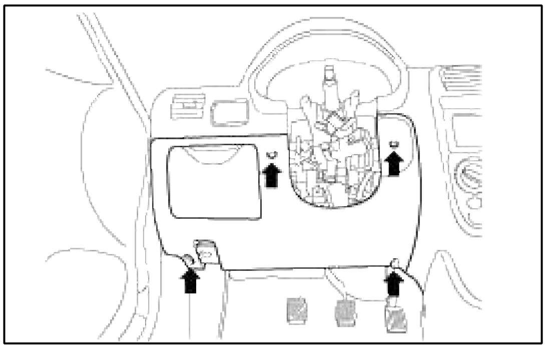
6. Remove the connectors of the airbag clock spring and the multifunction switch.



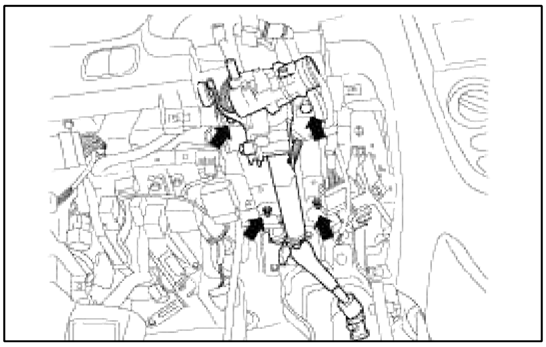
7. Remove the multifunction switch assembly from the steering shaft.



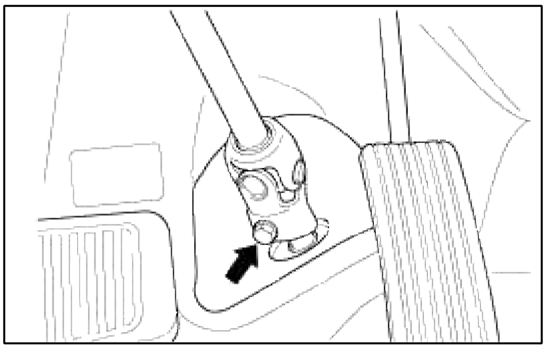
8. After removing 4 connecting bolts, remove the lower crash pad.



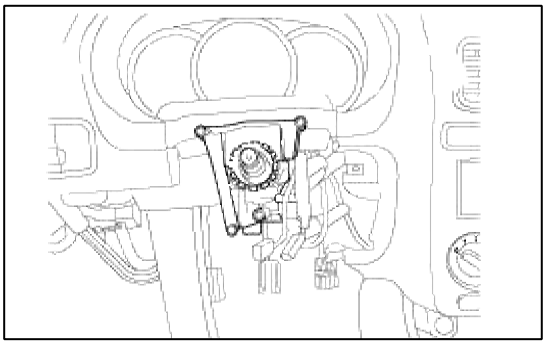
9. Remove the 4 bolts fixing the steering column shaft.



10. Remove the bolt from the universal joint and gear box connecting portion.

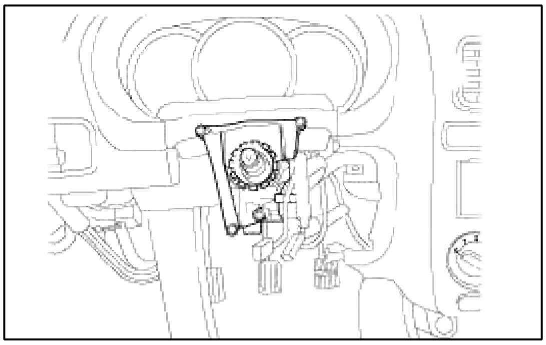


11. Remove the steering column shaft assembly.

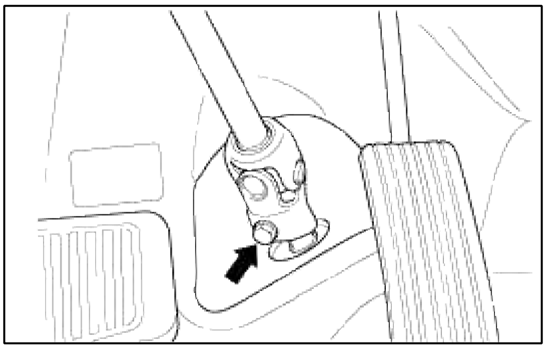


INSTALLATION

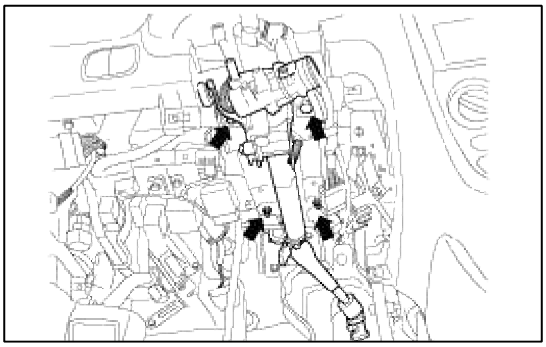
1. Place the steering columnshaft in position and install the 4 mounting bolts temporarily.



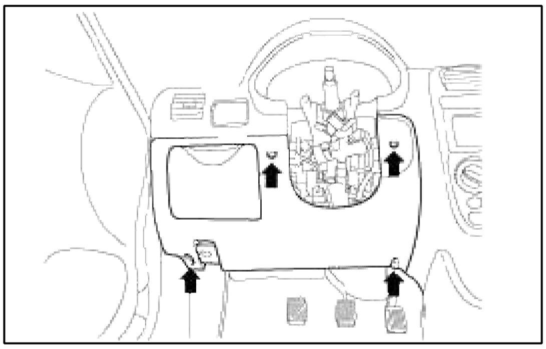
2. Install the bolt on the universal joint and gear box connecting part in the driver's side brake pedal lower portion.



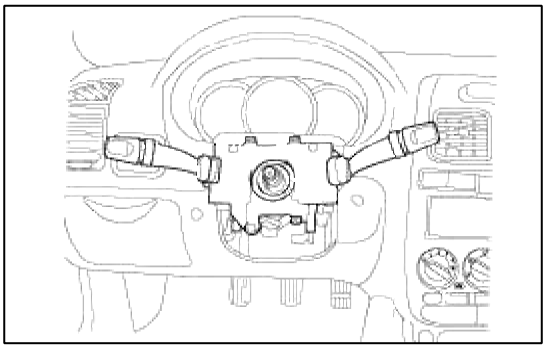
3. Completely tighten the temporarily installed 4 mounting bolts on the steering column shaft.



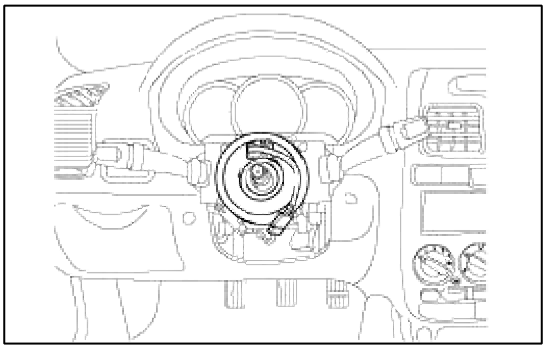
4. After installing the lower crash pad, tighten the 4 bolts.



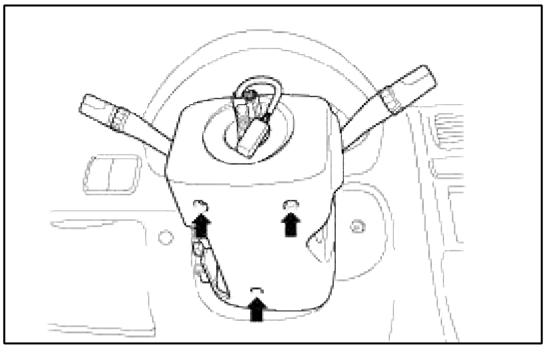
5. Install the multi-function switch to the steering column shaft by pushing it until it reashes the marked portion.



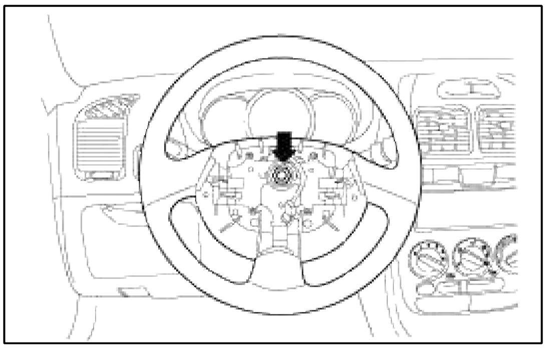
6. Install the SRS clock spring and multi-function switch connector.



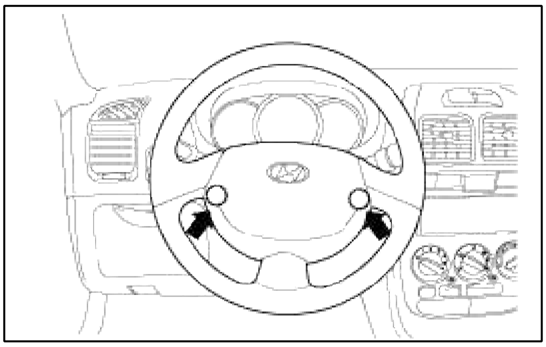
7. After installing the upper/lower column shroud, tighten the 3 bolts.



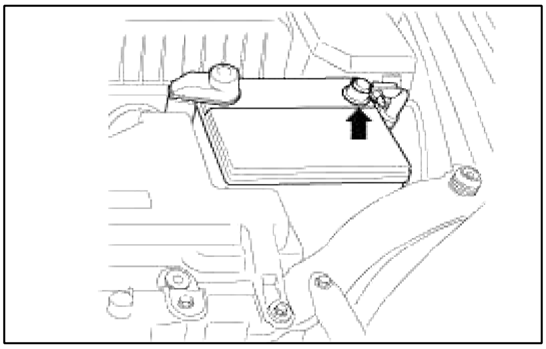
8. Fix the steering wheel with a lock nut.



9. Fix the SRS module to the steering wheel with 2 bolts.



10. Connect the (-) negative battery cable.

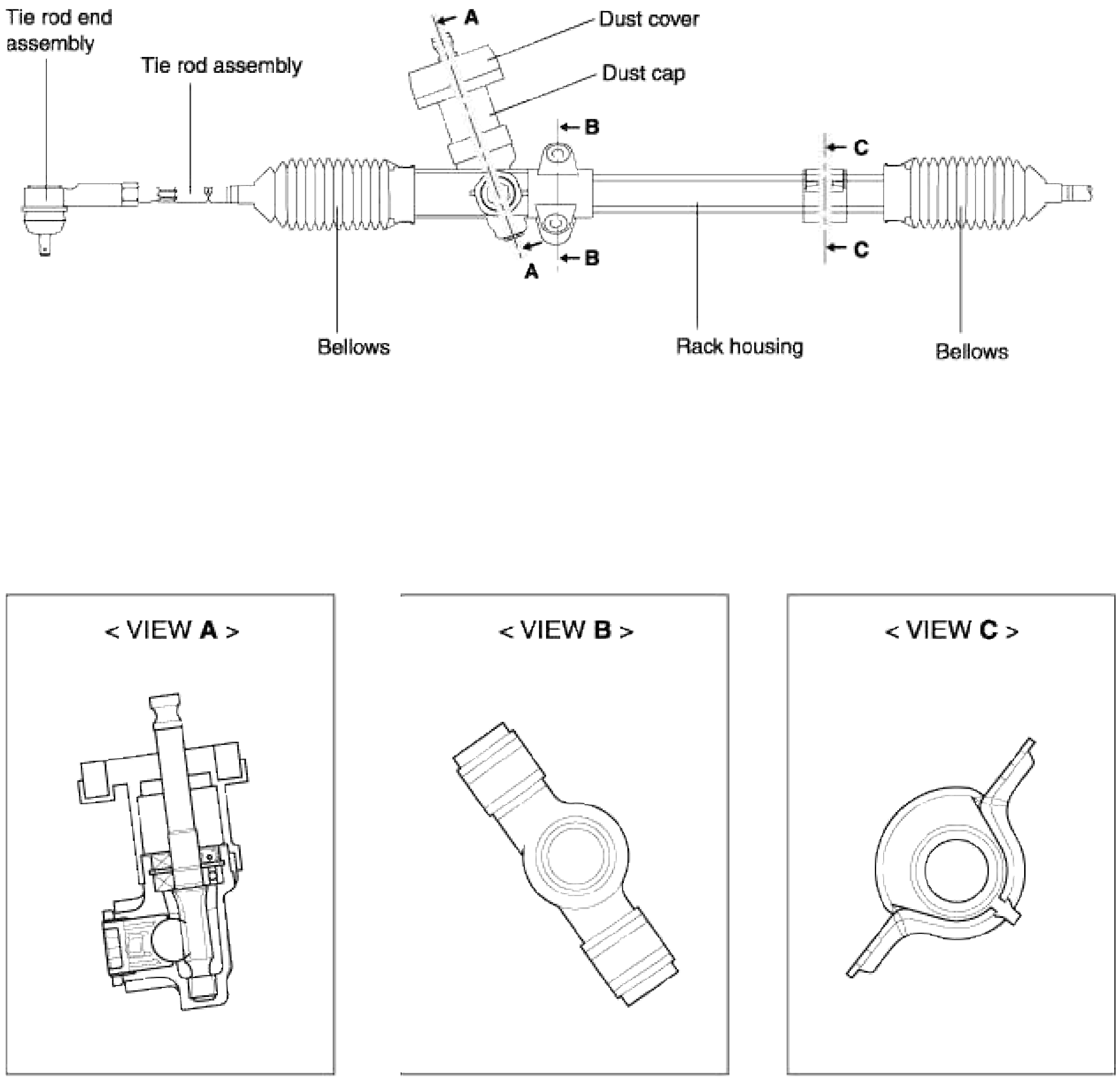


INSPECTION

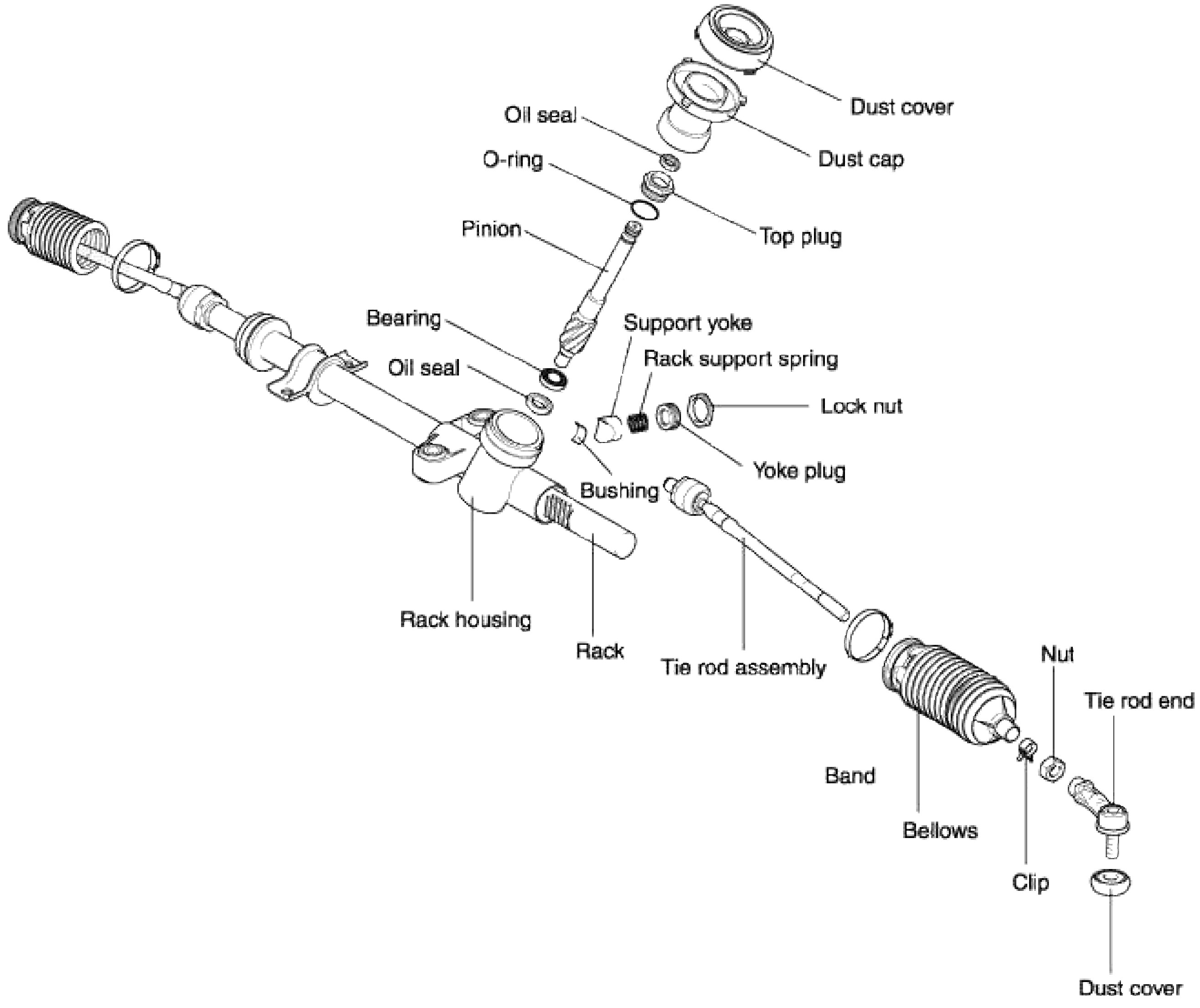
1. Check the steering column shaft for damage and deformation.
2. Check connections for play, damage and smooth operation.
3. Check the ball joint bearing for wear and damage.

Steering System > Manual Steering System > Manual Steering Gear Box > Components and Components Location

COMPONENTS


Tie rod end assembly
Tie rod assembly
A
Dust cover
Dust cap
B
C
Bellows
A
B
C
Rack housing
Bellows
< VIEW A >
< VIEW B >
< VIEW C >

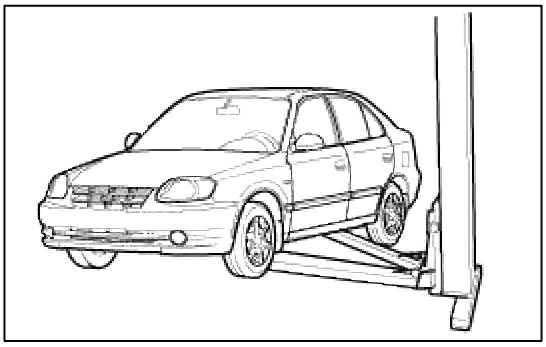
COMPONENTS


Dust cover
Oil seal
Dust cap
O-ring
Top plug
Pinion
Bearing
Support yoke
Rack support spring
Oil seal
Lock nut
Yoke plug
Bushing
Rack housing
Rack
Tie rod assembly
Nut
Tie rod end
Band
Bellows
Clip
Dust cover

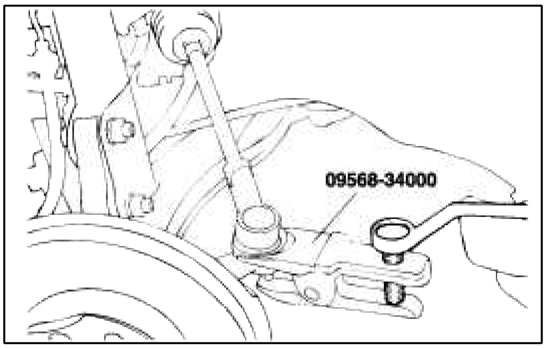
Steering System > Manual Steering System > Manual Steering Gear Box > Repair procedures

REMOVAL

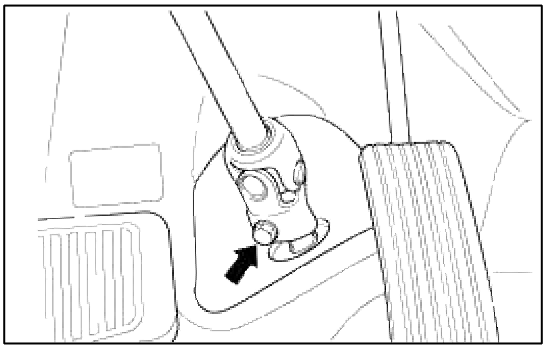
1. Support the specified point of the vehicle with a lift.



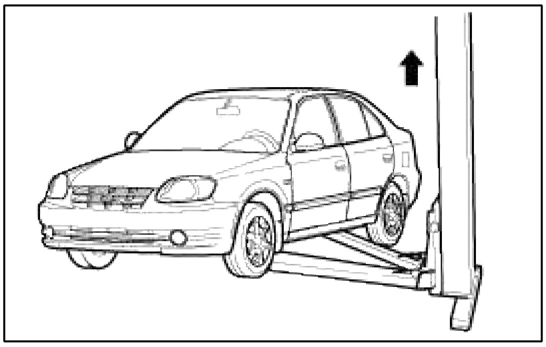
2. Remove the front tires (RH/LH).
3. After removing the split pin, disconnect the tie rod from the knuckle by using the speicial tool.



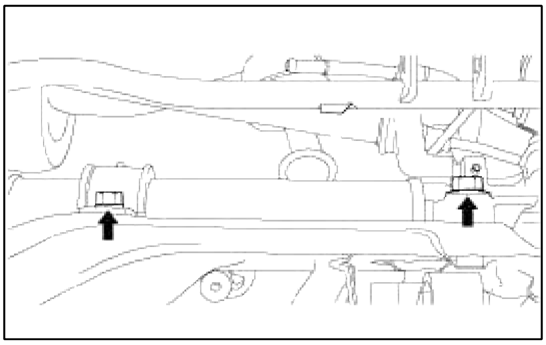
4. Disconnect the shaft assembly from the gear box inside the passenger compartment.



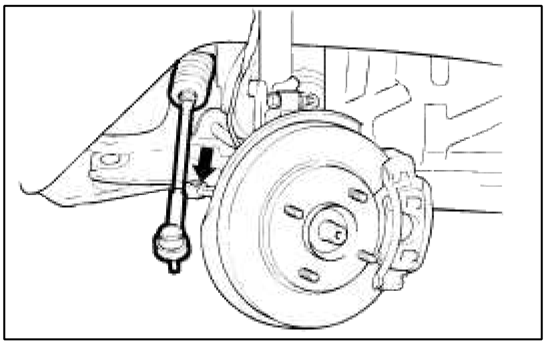
5. Raise up the vehicle.



6. Remove the manual steering gear box mounting bolt and clamp.

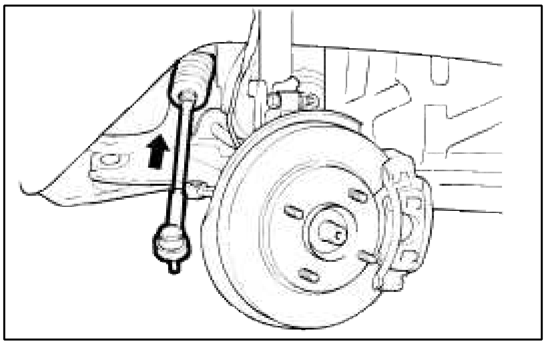


7. Separate the manual steering gear box assembly by pulling it toward the right side of the vehicle.

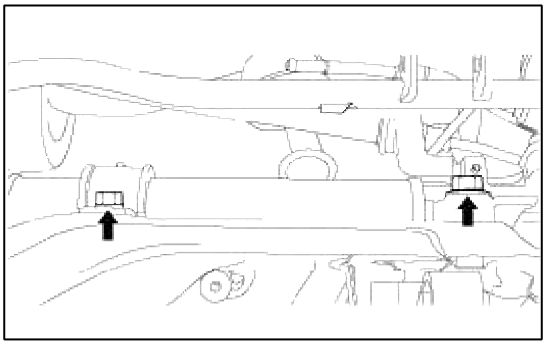


INSTALLATION

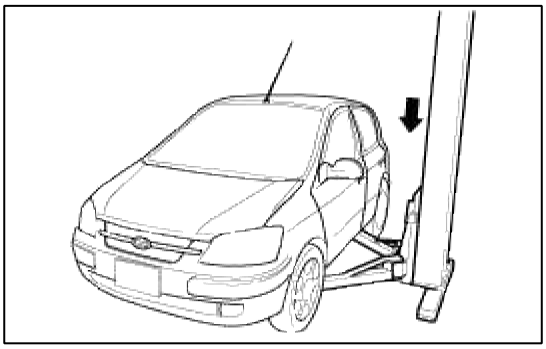
1. Install the manual steering gear box assembly by inserting it from the right side.



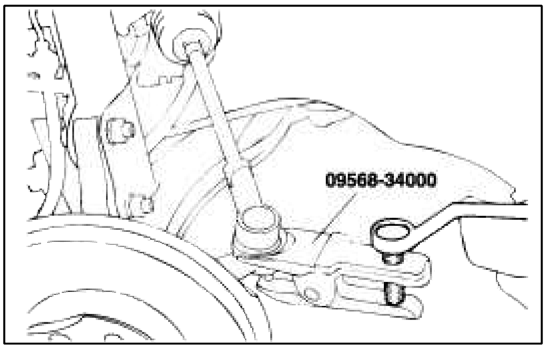
2. Fix the manual steering gear box to the crossmember.



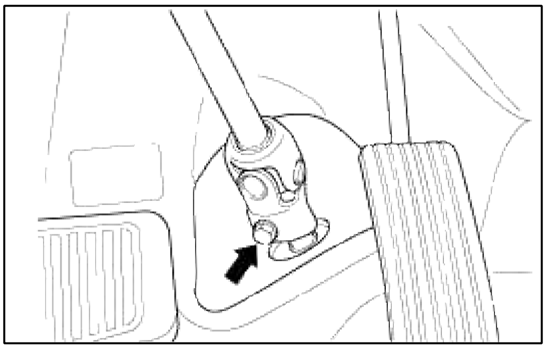
3. Lower the vehicle.



4. Connect the tie rod to the LH/RH knuckles.

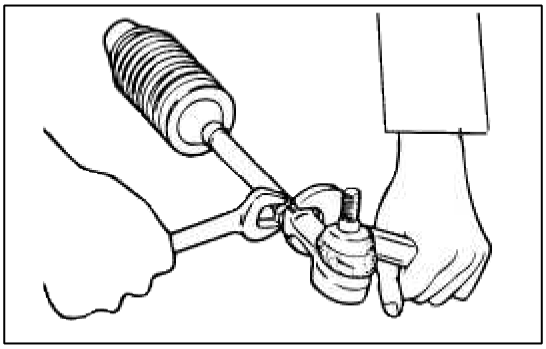


5. Install the tires (LH/RH).
6. Connect the steering shaft assembly to the gear box in the passenger compartment.

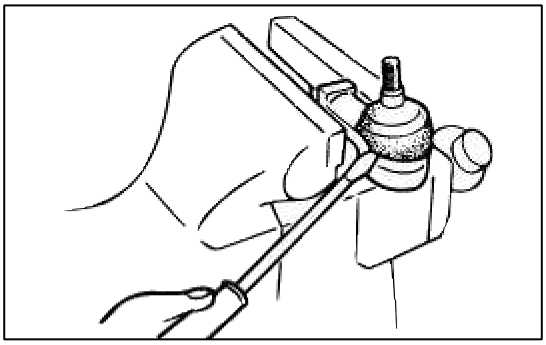


DISASSEMBLY

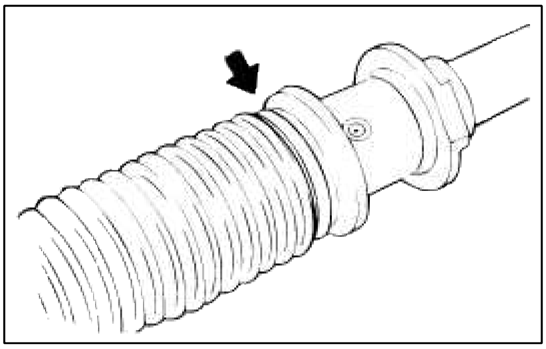
1. Remove the tie rod end from the tie rod.



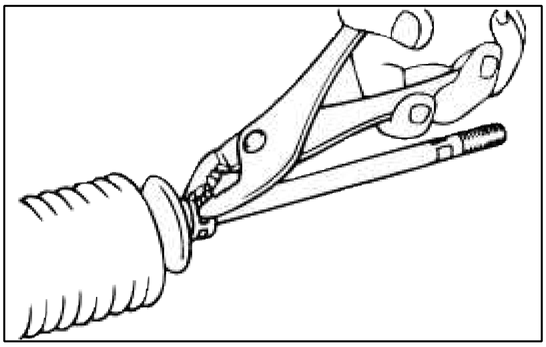
2. After mounting the tie rod end in a vise, remove the dust cover from the ball joint.



3. Remove the bellows band.



4. Remove the bellows clip.

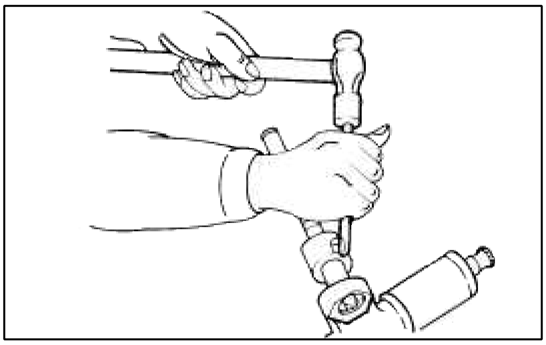


5. Pull the bellows out toward the tie rod.

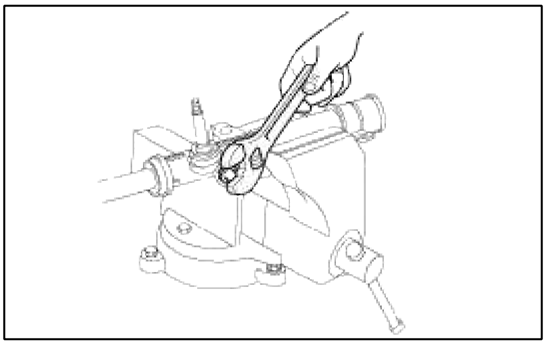
NOTE

Check for rust on the rack when the bellows are replaced.

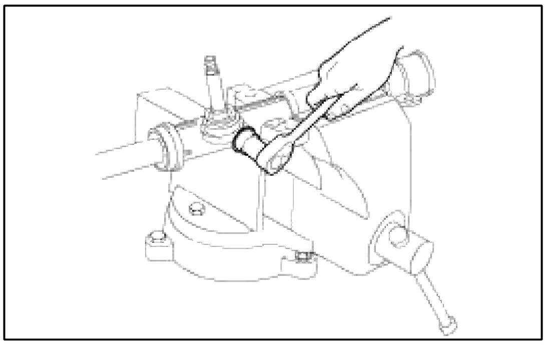
6. Unstake the tab washer which fixes the tie rod and rack with a chisel.



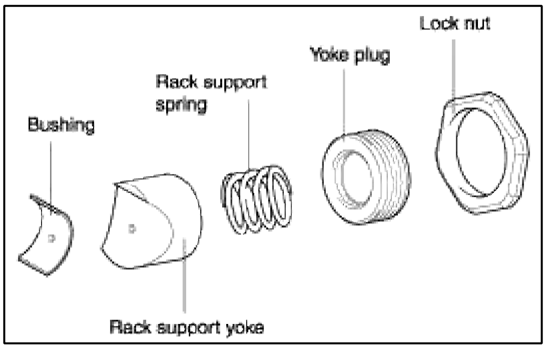
7. Remove the yoke plug lock nut.



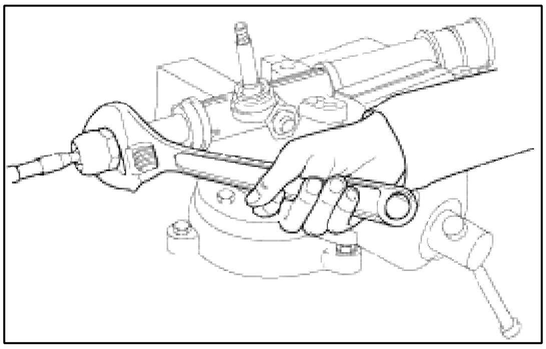
8. Remove the yoke plug with a 14mm socket.



9. Remove the lock nut, yoke plug rack support spring, rack support yoke and bushing.


Lock nut
Yoke plug
Rack support spring
Bushing
Rack support yoke

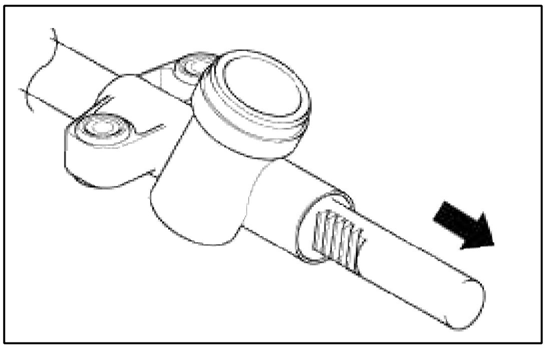
10. Move the rack completely toward the housing and mount the rack tooth portion in a brass plate of a vise. At the state of step 11, loosen the tie rod ball joint, then remove the tie rod assembly from the rack.



11. Remove the rack from the gear housing.

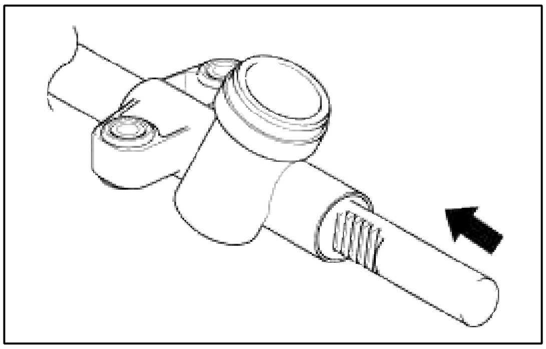
CAUTION

Remove the rack toward the left side of the vehicle so as not to damage the bushing by the rack teeth.



REASSEMBLY

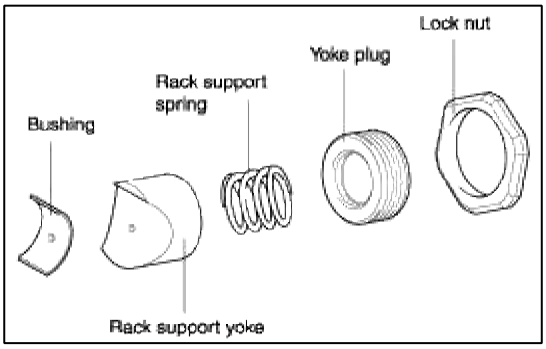
1. Apply the specified grease to the rack, insert the rack into the gear housing, and then insert the pinion into the gear housing.
   - A. Make sure that the rack is inserted into the gear housing from the left side.
   - B. When inserting the pinion into the gear housing, the pinion gear should be in mesh with the rack gear.
   - C. Wipe off excessive grease.



2. Prior to oil seal installation in the gear box, apply grease to the surface of the oil seal.

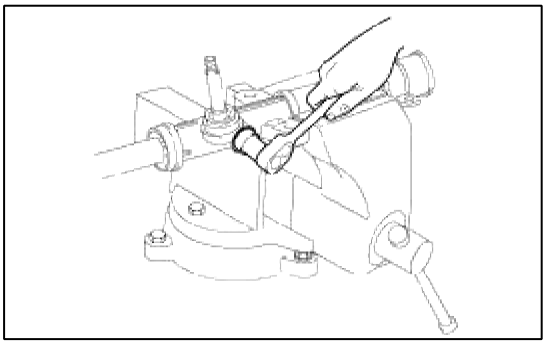
> **NOTE**
>
> Be sure to use a new oil seal.

3. Install the rack support yoke, rack support spring, yoke plug, and lock nut to the pinion gear box.

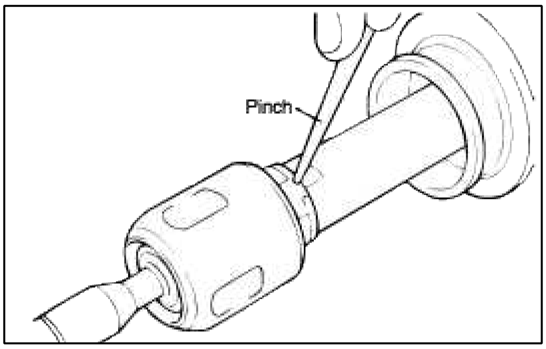


4. Tighten the yoke plug to 11Nm (112 kg·cm, 8 lb·ft) and then back off 30°~60°. Secure the yoke plug with the lock nut.

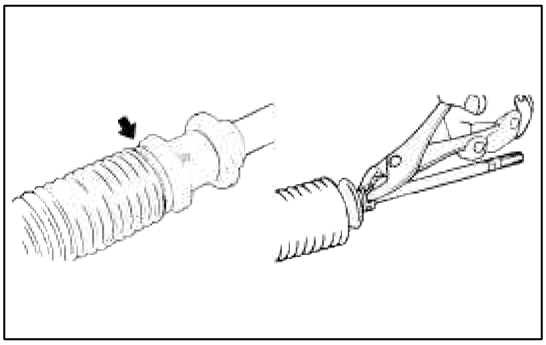
> **CAUTION**
>
> 1. Adjust the yoke plug with the rack in the neutral position.
> 2. Apply a sealer between the lock nut and the housing.



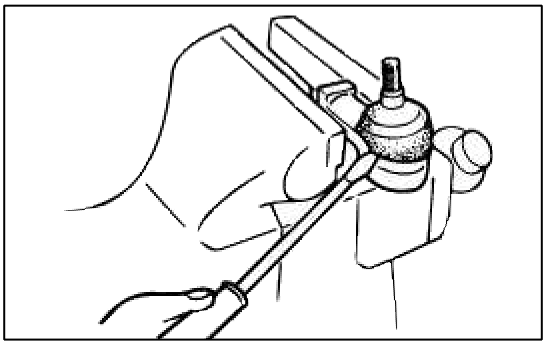
5. After installing the tie rod to the rack, punch on a point over the tie rod with a chisel.



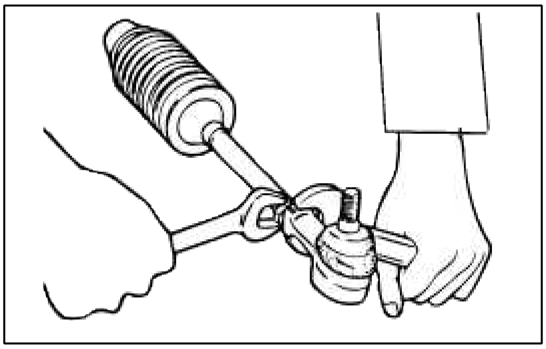
6. Install the bellows in position and fix it with the band and clip.



7. Mount tie rod end in a vise and install the dust cover to the tie rod end.



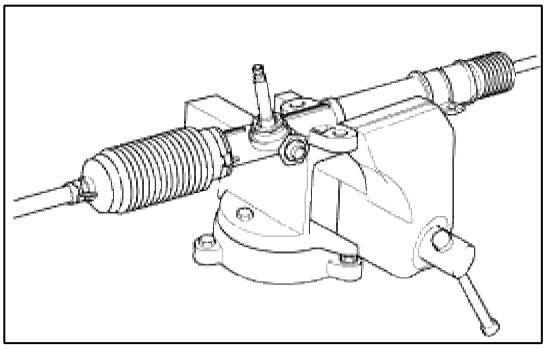
8. Install the tie rod to the tie rod end.



INSPECTION AND ADJUSTMENT BEFORE DISASSEMBLY

CAUTION

When mounting the gear box in a vise, let the installation section of it be fixed to the jaws. If other section is fixed the gear box may be damaged.



TOTAL PINION PRELOAD

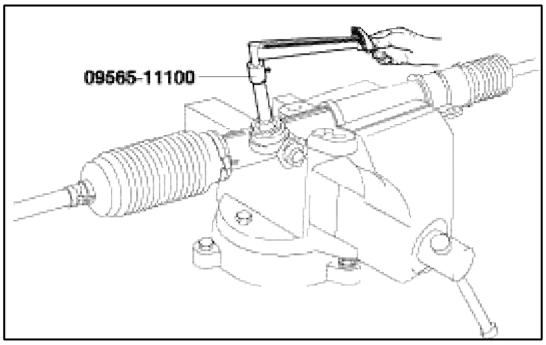
1. Rotate the pinion gear for approximately 4 to 6 seconds for one rotation to measure the total pinion preload.

Standard value

0.6~1.3 Nm (6~13 kg·cm, 0.4~1.0 lb·ft)

NOTE

Measure the pinion preload through the entire stroke of the rack.



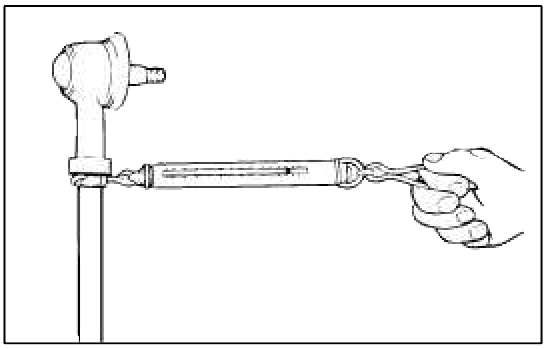
2. If the measured value is out of specifications, first adjust the yoke plug, then recheck the total pinion preload.
3. If you adjust the yoke plug but do not obtain the total pinion preload, check or replace the yoke plug components.

TIE ROD SWING RESISTANCE

1. Rotate the tie rod severely ten times.
2. Measure the tie rod swing resistance with a spring scale.

Standard value

2~5 Nm (20~50 kg·cm, 1.4~3.6 lb·ft)



3. If the measured value exceeds the standard value, replace the tie rod assembly.

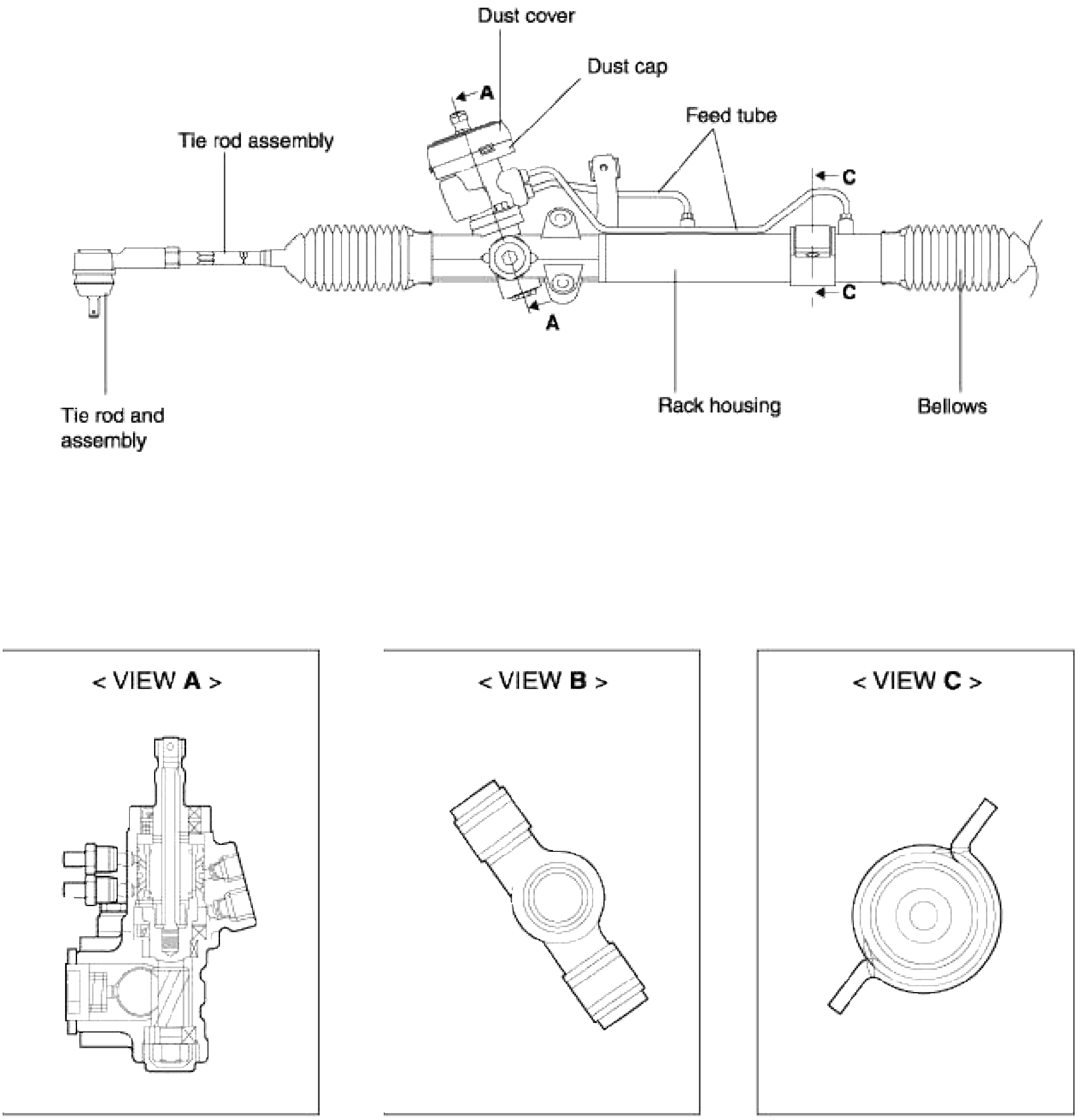
> **CAUTION**
>
> Even if the measured value is below the standard value, the tie rod that swings smoothly without excessive play may be used. If the measured value is below 0.44 kg·cm, replace the tie rod.

BELLOWS INSPECTION

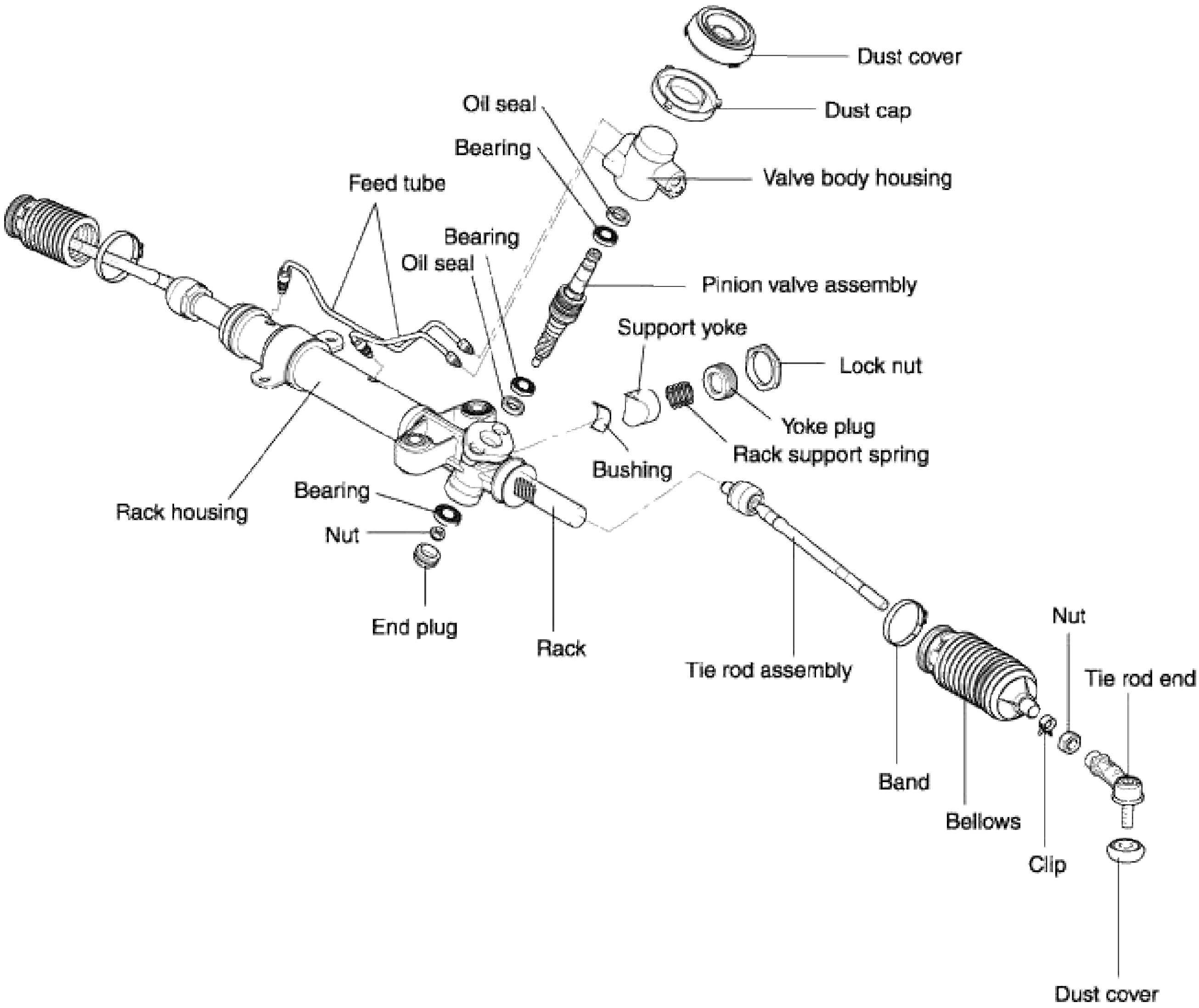
1. Inspect the bellows for damage or deterioration.
2. Make sure the bellows are secured in the correct position.
3. If the bellows are defective, replace them with new ones.

Steering System > Hydraulic Power Steering System > Power Steering Gear Box > Components and Components Location

COMPONENTS


Dust cover
Dust cap
A
Feed tube
Tie rod assembly
C
C
A
Tie rod and assembly
Rack housing
Bellows
< VIEW A >
< VIEW B >
< VIEW C >

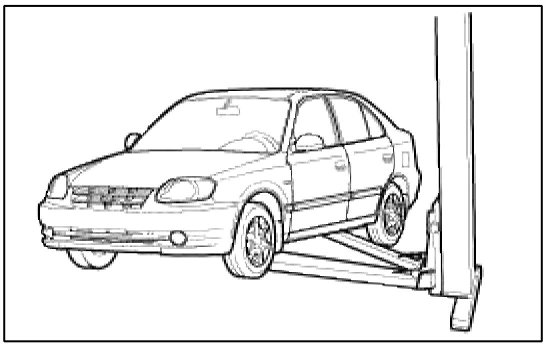
COMPONENTS


Dust cover
Dust cap
Oil seal
Bearing
Valve body housing
Feed tube
Bearing
Oil seal
Pinion valve assembly
Support yoke
Lock nut
Yoke plug
Rack support spring
Bushing
Rack housing
Bearing
Nut
End plug
Rack
Tie rod assembly
Nut
Tie rod end
Band
Bellows
Clip
Dust cover

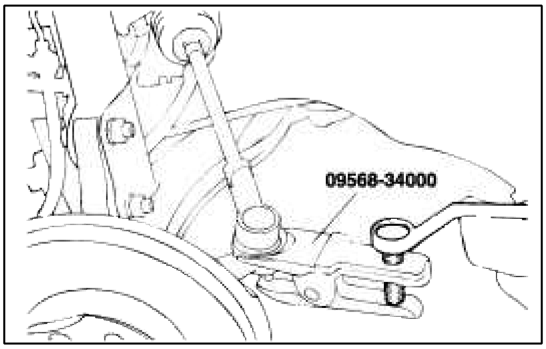
Steering System > Hydraulic Power Steering System > Power Steering Gear Box > Repair procedures

REMOVAL

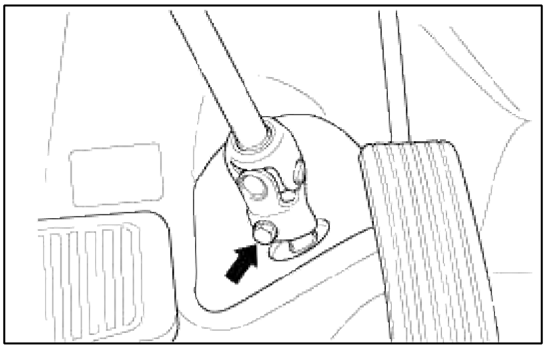
1. Support the specified portion of the vehicle with a lift.



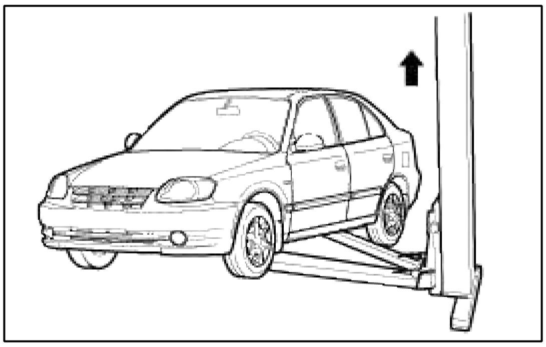
2. Drain the power steering fluid.
3. Remove the front tires (RH/LH).
4. After removing the split pin, disconnect the tie rod from the knuckle by using the special tool.



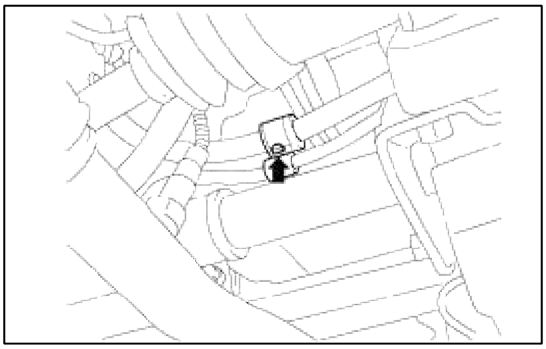
5. Disconnect the steering shaft assembly from the gear box inside the passenger compartment.



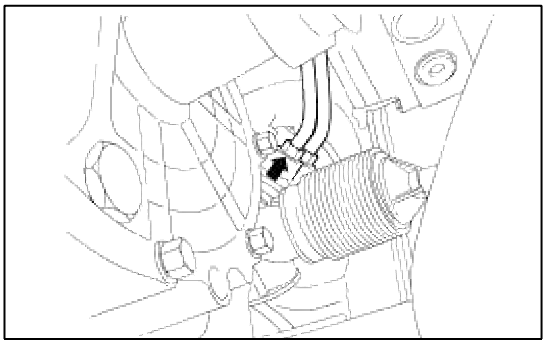
6. Raise up the vehicle.



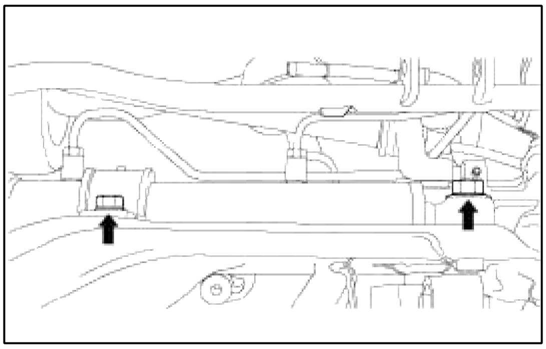
7. Loosen the power steering pressure tube mounting clamp and return tube mounting clamp mounting bolt.



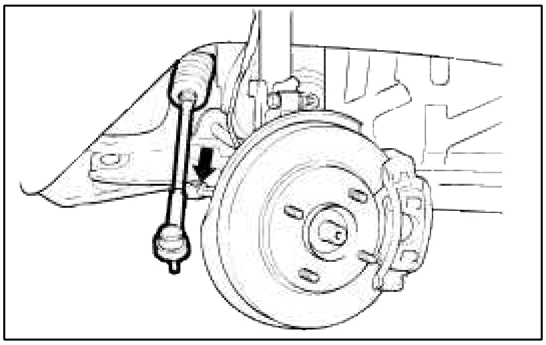
8. Disconnect the pressure tube and return tube fitting from the power steering gear box.



9. Remove the power steering gear box mounting bolt and clamp.

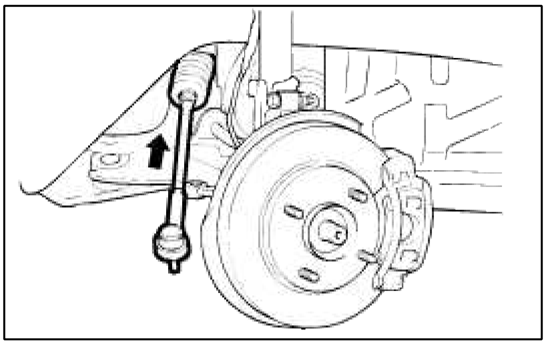


10. Separate the power steering gear box assembly by pulling it toward the rights side of the vehicle.

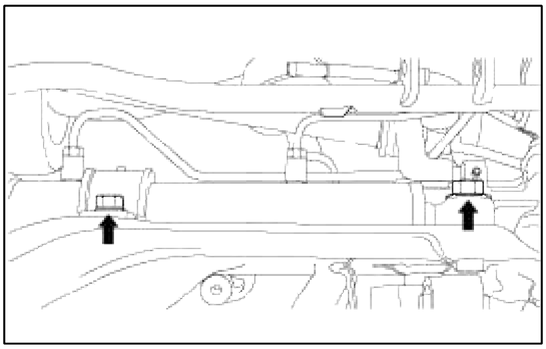


INSTALLATION

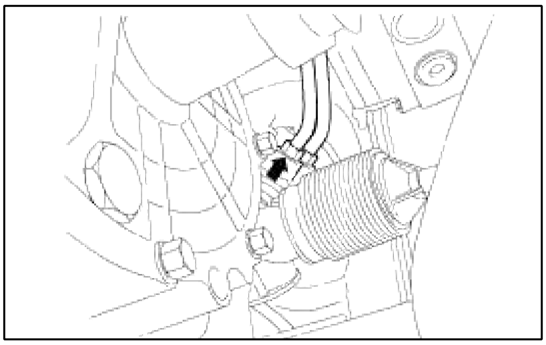
1. Push in the power steering gear box assembly in the right side of the vehicle.



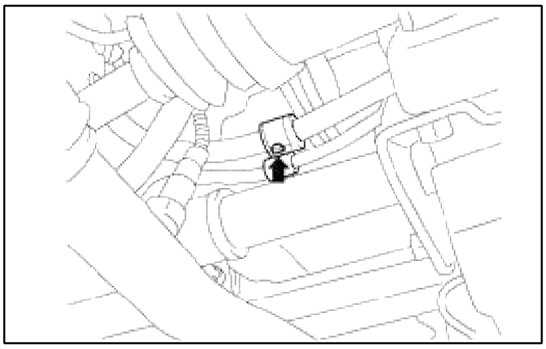
2. Fix the power steering gear box to the crossmember.



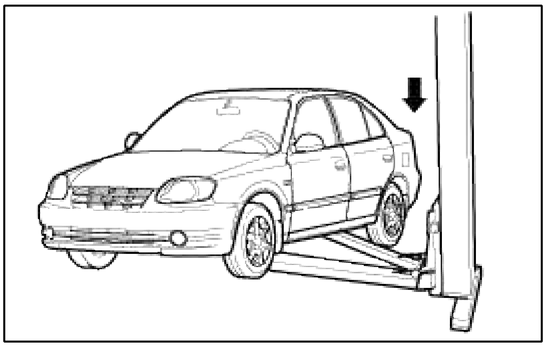
3. Install the pressure tube and return tube fitting to the power steering gear box.



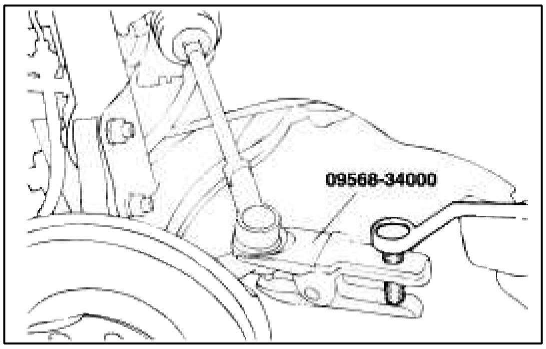
4. Fix the power steering pressure hose and return tube mounting clamp with the bolt.



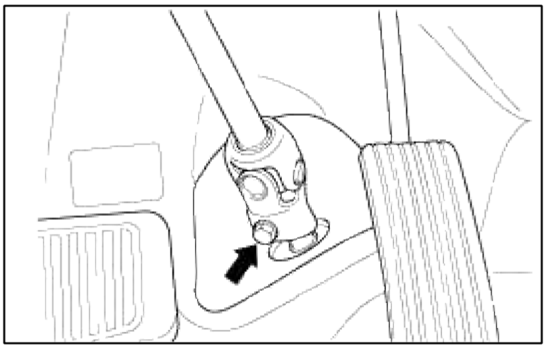
5. Slowly lower the vehicle.



6. Connect the tie rod to the knuckles (RH/LH)



7. Install the tires (RH/LH)
8. Connect the steering shaft to the driver side gear box.

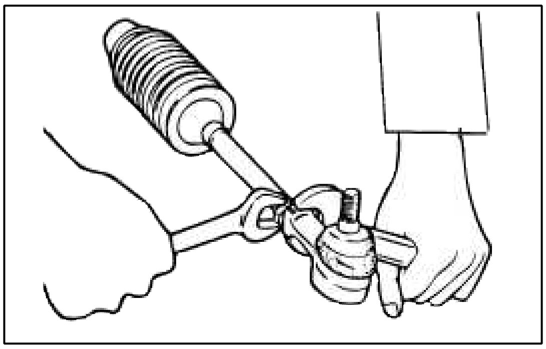


9. Apply the power steering fluid.

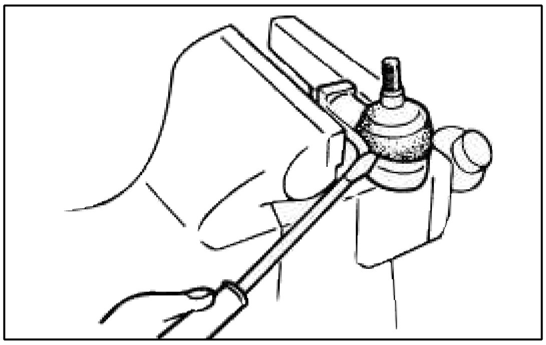
10. Bleed the air.

DISASSEMBLY

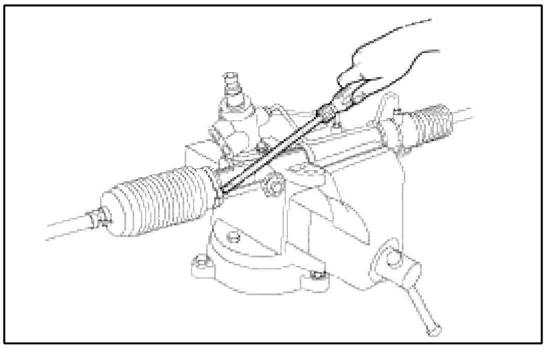
1. Remove the tie rod end from the tie rod.



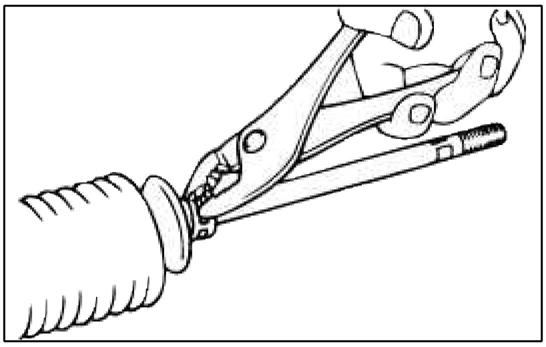
2. After mounting the tie rod end in a vise, remove the dust cover from the ball joint.



3. Remove the bellows band.



4. Remove the bellows clip.

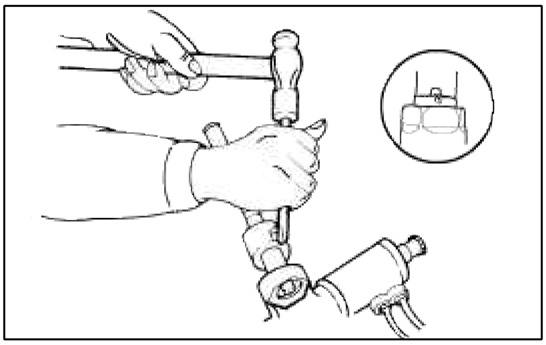


5. Pull the bellows out toward the tie rod.

> **NOTE**
>
> Check for rust on the rack when the bellows are replaced.

6. While moving the rack slowly, drain the fluid from the rack housing.

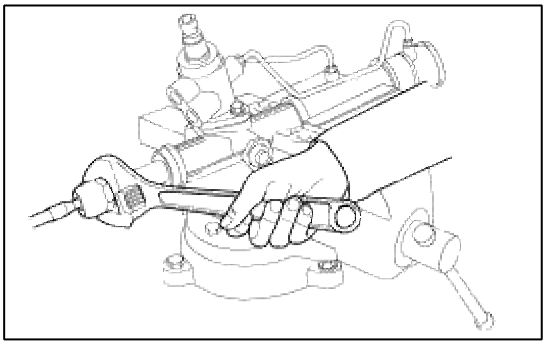
7. Unstake the tab washer which fixes the tie rod and rack with a chisel.



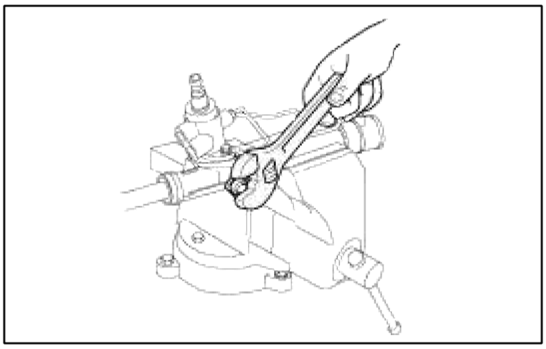
8. Remove the tie rod from the rack.

CAUTION

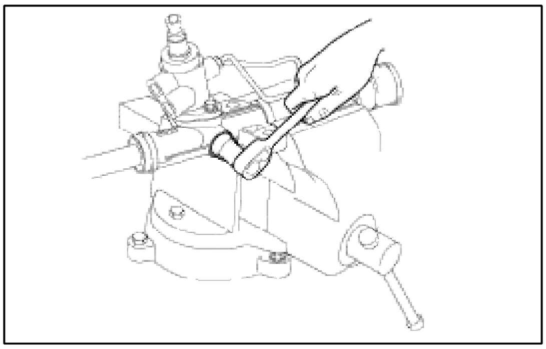
Remove the tie rod from the rack, taking care not to twist the rack.



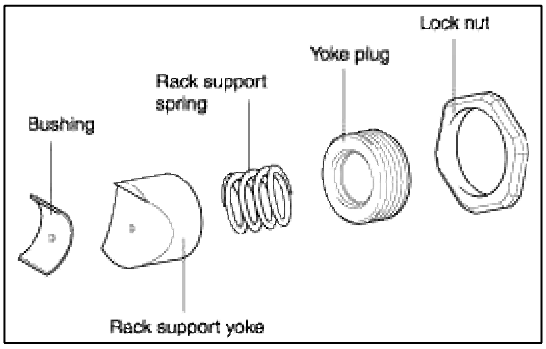
9. Remove the yoke plug lock nut.



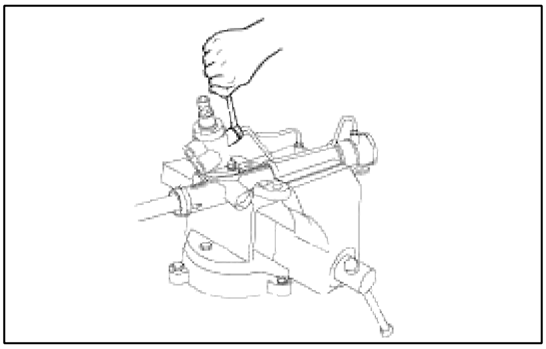
10. Remove the yoke plug with a 14mm socket.



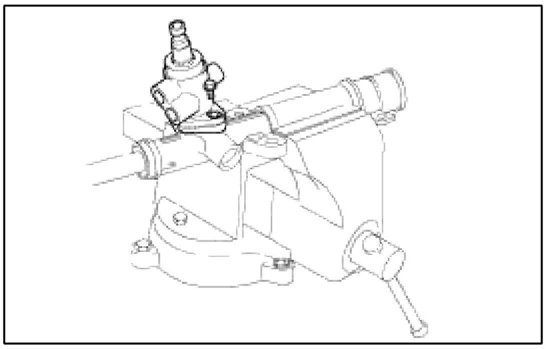
11. Remove the lock nut, yoke plug, rack support spring, rack support yoke and bushing from the gear box.


Lock nut
Yoke plug
Rack support spring
Bushing
Rack support yoke

12. Remove the feed tube from the rack housing.



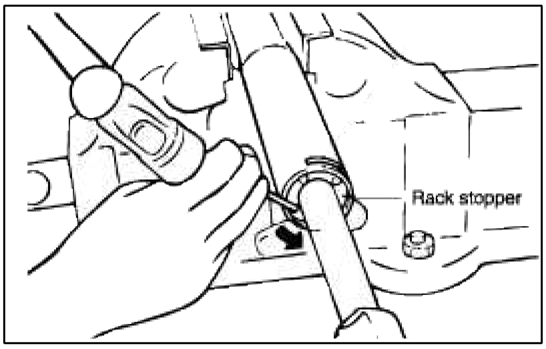
13. Remove the valve body housing by loosening the two bolts.



14. When the end of the circlip comes out of the notched hole of the housing rack cylinder, turn the rack stopper counterclockwise and remove the circlip.

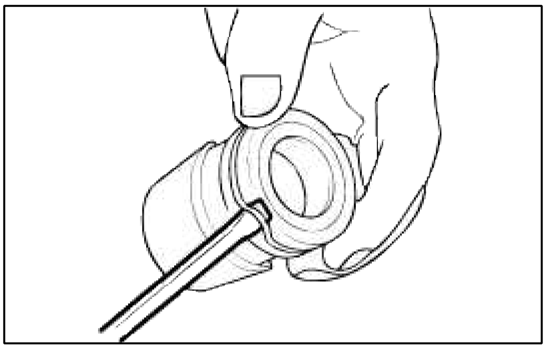
CAUTION

Be careful not to damage the rack.

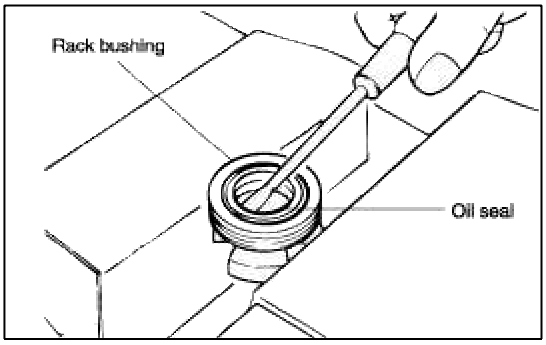

Rack stopper

15. Remove the rack bushing and rack from the rack housing.

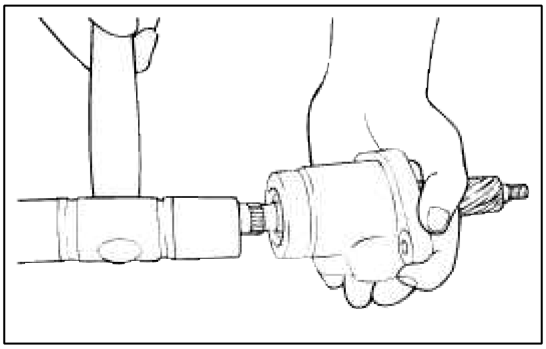
16. Remove the O-ring from the rack bushing.



17. Remove the oil seal from the rack bushing.


Rack bushing
Oil seal

18. Remove the valve body from the valve body housing with a soft hammer.

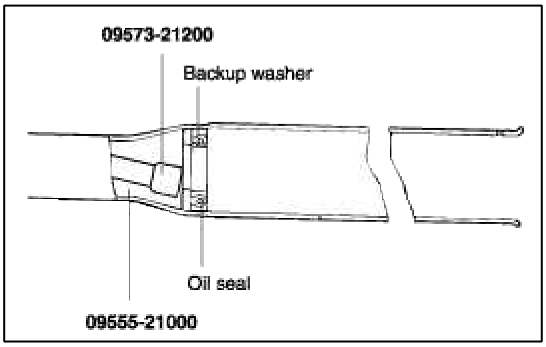


19. Remove the oil seal and ball bearing from the valve body housing.
20. Remove the oil seal and O-ring from the rack housing.

CAUTION

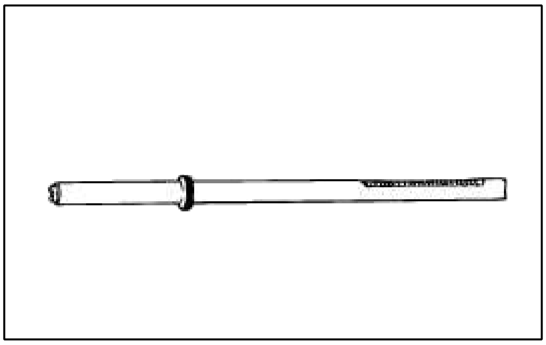
Be careful not to damage the pinion valve cylinder bore of the rack housing.

21. Using the special tool, remove the oil seal and ball bearing from the valve body housing.

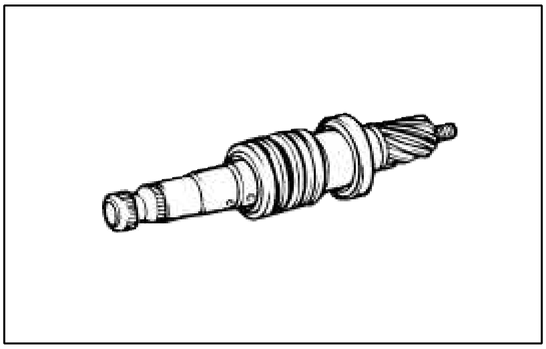

09573-21200
Backup washer
Oil seal
09555-21000

INSPECTION

1. **Rack**
    (1) Check for rack tooth face damage or wear
    (2) Check for oil seal contact surface damage
    (3) Check for rack bending or twisting
    (4) Check for oil seal ring damage or wear
    (5) Check for oil seal damage or wear



2. **Pinion valve**
    (1) Check for pinion gear tooth face damage or wear
    (2) Check for oil seal contact surface damage
    (3) Check for seal ring damage or wear
    (4) Check for oil seal damage or wear



3. **Bearing**
    (1) Check for seizure or abnormal noise during a bearing rotation
    (2) Check for excessive play
    (3) Check for missing needle bearing rollers
4. **Others**
    (1) Check for damage of the rack housing cylinder bore
    (2) Check for boot damage, cracking or aging

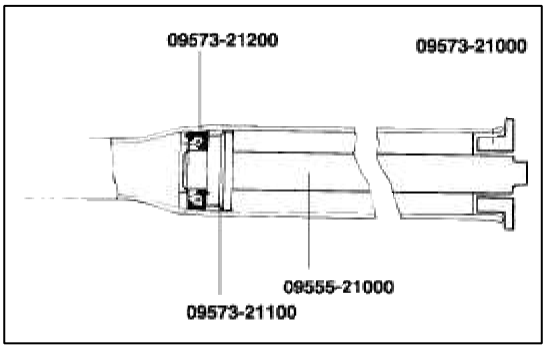
REASSEMBLY

1. Apply the specified fluid to the entire surface of the rack oil seal.

Recommended fluid : PSF-3

---

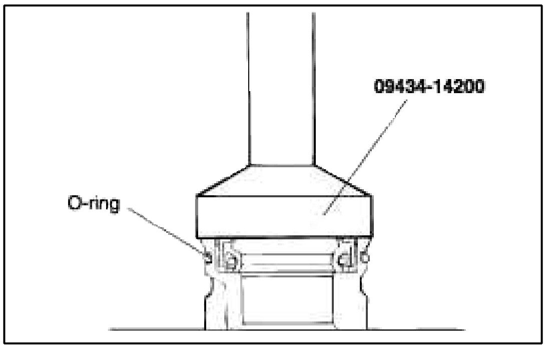
2. Install the oil seal to the specified position in the rack housing.


09573-21200
09573-21000
09555-21000
09573-21100

3. Apply the specified fluid to the entire surface of the rack bushing oil seal.

Recommended fluid : PSF-3

4. Install the oil seal in the rack bushing.

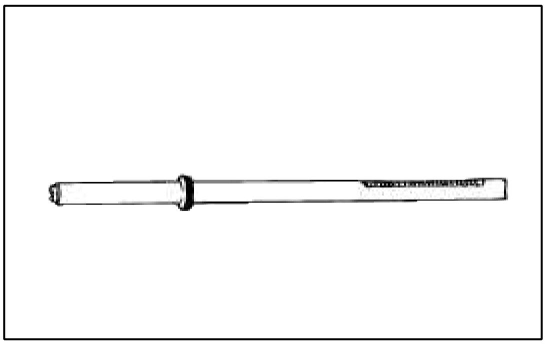

09434-14200
O-ring

5. Apply the specified fluid to the entire surface of the O-ring and install it in the rack bushing.
6. Apply the specified grease to the rack teeth.

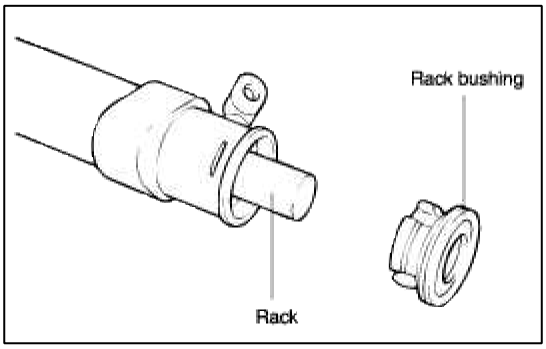
Recommended grease :
Multipurpose grease SAE J310a, NLGI #2 EP

NOTE

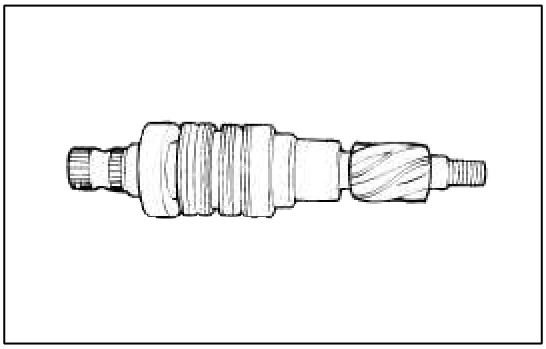
Do not plug the vent hole in the rack with grease.



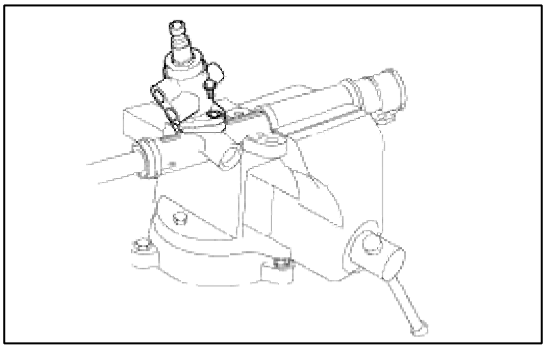
7. Insert the rack into the rack housing and push in the rack bushing until it is aligned with the notched hole of the rack housing, then install it.



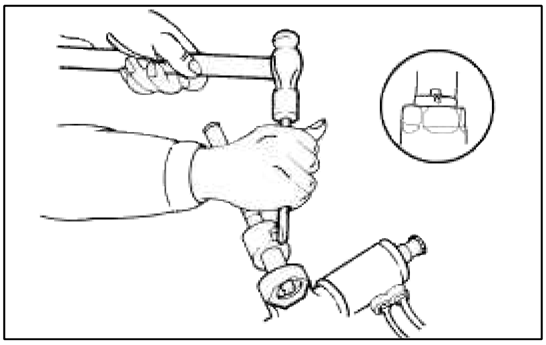
8. Using a special tool, install the oil seal and the ball bearing in the valve body housing.
9. After applying the specified fluid and grease to the pinion valve assembly, install it in the rack housing assembly.



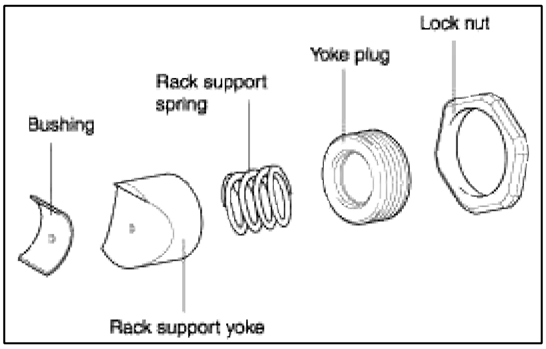
10. After applying the specified fluid to the oil seal, install it in the rack housing, and fix the valve body assembly and O-ring in the gear box.



11. Install the tie rod and punch on a point over the tie rod with a chisel.



12. Install the bushing, rack support yoke, rack support spring and yoke plug in the order shown in the illustration. Apply semi-drying sealant to the threaded section of the yoke plug before installation.



13. With the rack placed in the center position, attach the yoke plug to the rack housing. Tighten the yoke plug to 12 Nm (120 kg·cm, 8.9 lb·ft), with a 14mm socket. Loosen the yoke plug approximately from 30° to 60° and tighten the yoke nut to the specified torque.

Tightening torque
50~70 Nm (500~700 kg·cm, 37~52 lb·ft)

14. Tighten the feed tube to the specified torque and install the mounting rubber using adhesive.
15. Apply the specified grease to the bellows mounting position (fitting groove) of the tie rod.

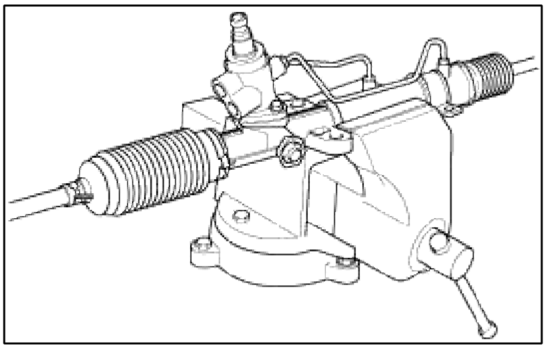
Recommended grease : Silicone grease

16. Install the new attaching band to the bellows.

NOTE

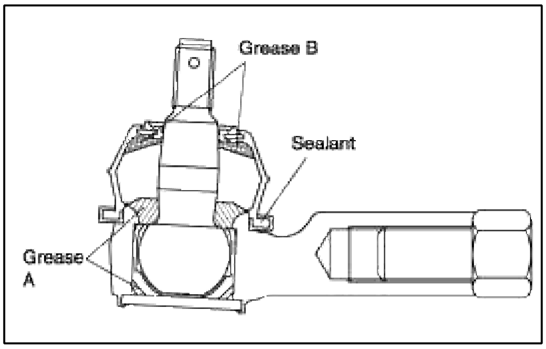
When the bellows are installed, a new band must be used.

17. Install the bellows in position, taking care not to twist it.

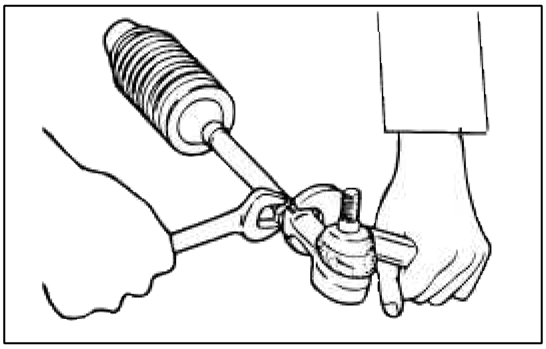


18. Fill the dust cover inner side and lip with the specified grease, and fix the dust cover in position with the clip ring attached in the groove of the tie rod end.

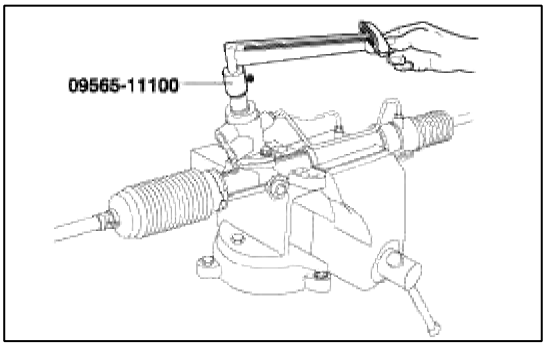
Recommended grease
A : POLY LUB GLY 801K or equivalent
B : SHOWA SUNLIGHT MB2 or equivalent
Dust cover inner side and lip : THREE BOND



19. Install the tie rod to the tie rod end.



20. Check for total pinion preload.



INSPECTION

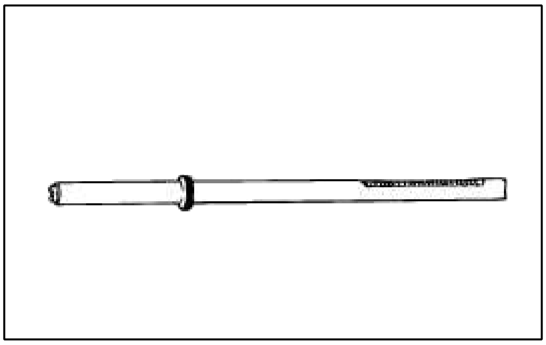
1. **Rack**
   (1) Check for rack tooth face damage or wear

   (2) Check for oil seal contact surface damage

   (3) Check for rack bending or twisting

   (4) Check for oil seal ring damage or wear

   (5) Check for oil seal damage or wear

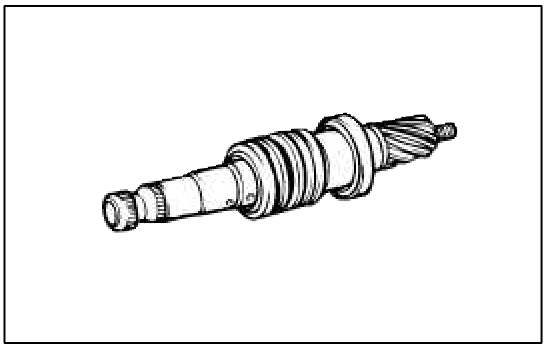


2. **Pinion valve**
   (1) Check for pinion gear tooth face damage or wear

   (2) Check for oil seal contact surface damage

   (3) Check for seal ring damage or wear

   (4) Check for oil seal damage or wear



3. **Bearing**
   (1) Check for seizure or abnormal noise during a bearing rotation

   (2) Check for excessive play

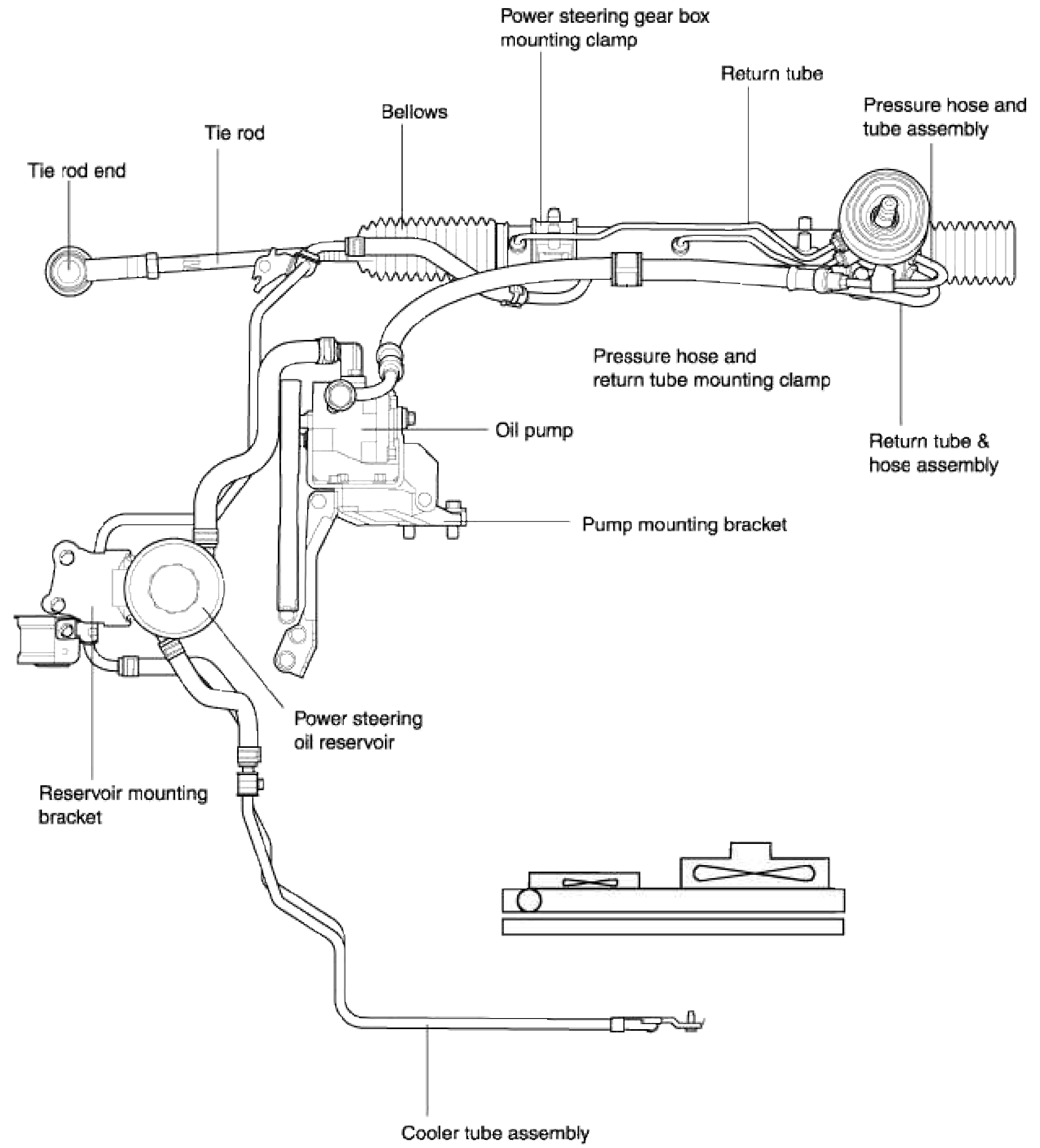
   (3) Check for missing needle bearing rollers

4. **Others**
   (1) Check for damage of the rack housing cylinder bore

   (2) Check for boot damage, cracking or aging

Steering System > Hydraulic Power Steering System > Power Steering Hoses > Components and Components Location

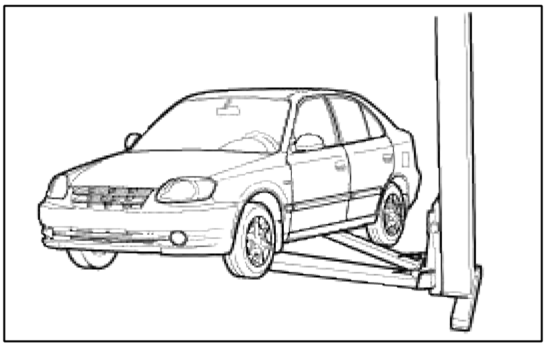
COMPONENTS


Power steering gear box mounting clamp
Return tube
Pressure hose and tube assembly
Bellows
Tie rod
Tie rod end
Pressure hose and return tube mounting clamp
Oil pump
Return tube & hose assembly
Pump mounting bracket
Power steering oil reservoir
Reservoir mounting bracket
Cooler tube assembly

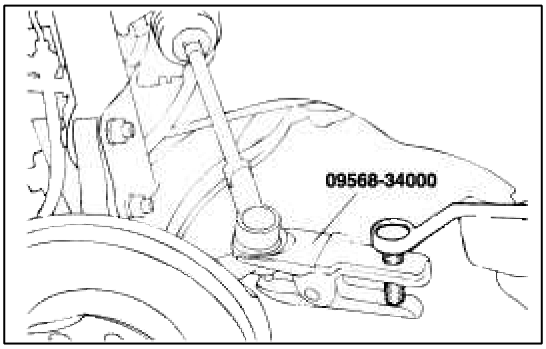
Steering System > Hydraulic Power Steering System > Power Steering Hoses > Repair procedures

REMOVAL

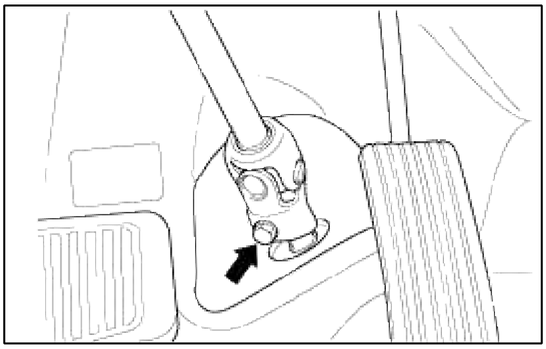
1. Support the specified point of the vehicle with a lift.



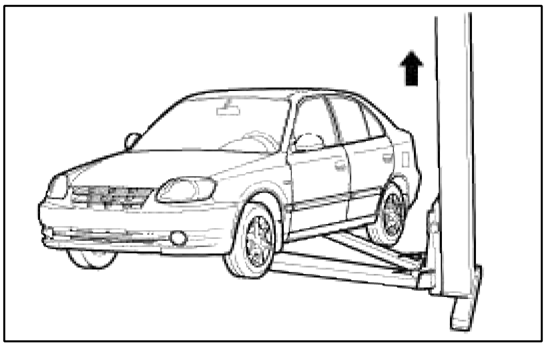
2. Drain the power steering fluid.
3. Remove the front tires (RH/LH).
4. After removing the split pin, disconnect the tie rod from the knuckle using a special tool (09568-34000).



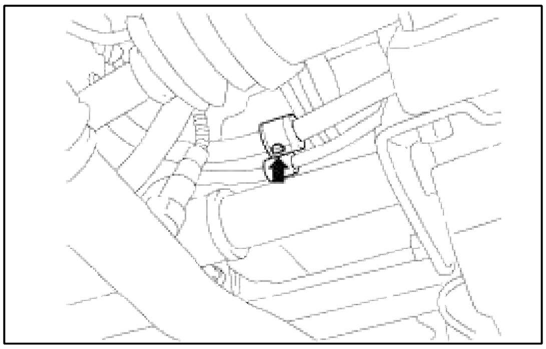
5. Disconnect the shaft assembly from the gear box inside the passenger compartment.



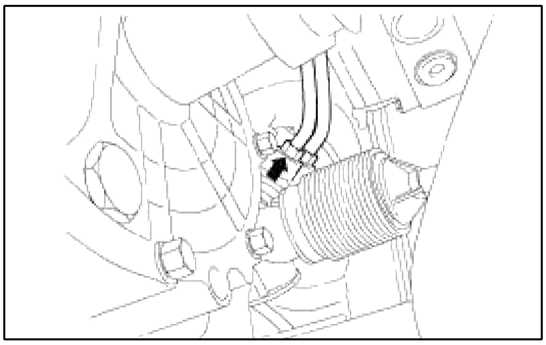
6. Raise up the vehicle.



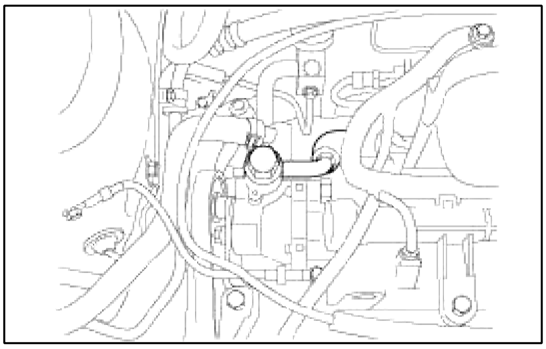
7. Loosen the power steering pressure tube mounting clamp and return tube mounting clamp mounting bolt.



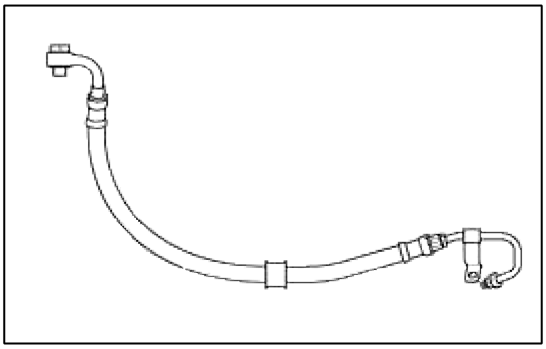
8. Disconnect the pressure tube and return tube fitting from the power steering gear box.



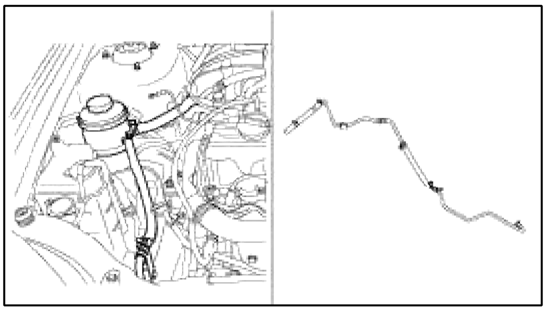
9. Lower the vehicle and disconnect the pressure hose connector from the oil pump. (When removing the pressure hose)



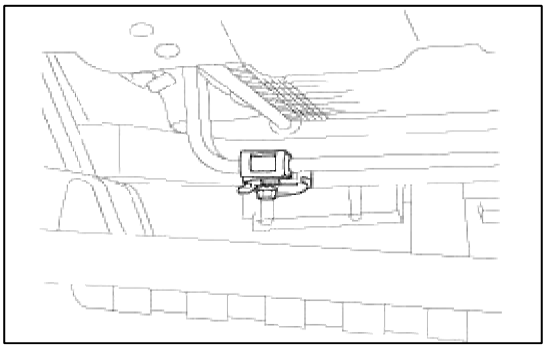
10. Disconnect the pressure hose assembly. (When removing the pressure hose)



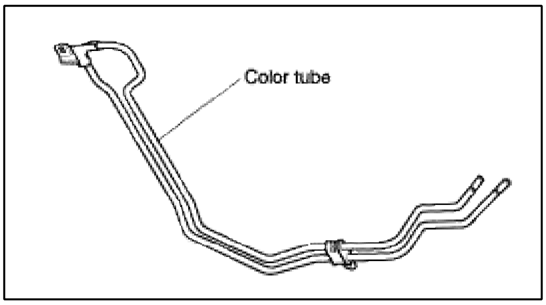
11. After removing the clip from the color tube, removing the return tube and hose. (When removing the return tube and hose)



12. Remove the 10mm color tube mounting clip bolt. (When removing the color tube)

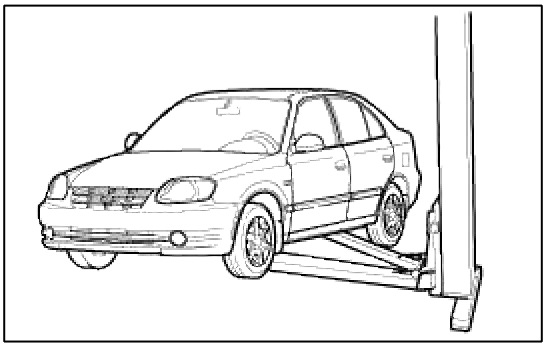


13. Disconnect the remove the color tube from the power steering oil reservoir tank side hose. (When working on the color tube)

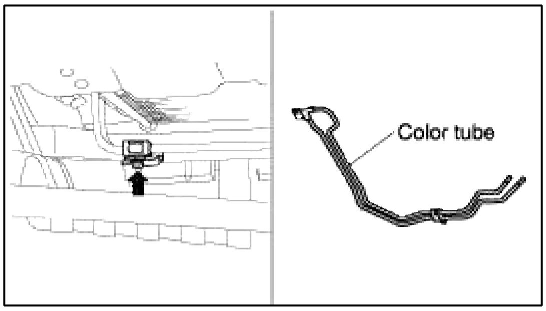


INSTALLATION

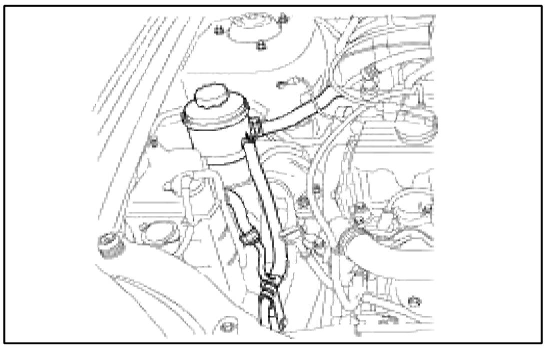
1. Support the specified portion of the vehicle with a lift.



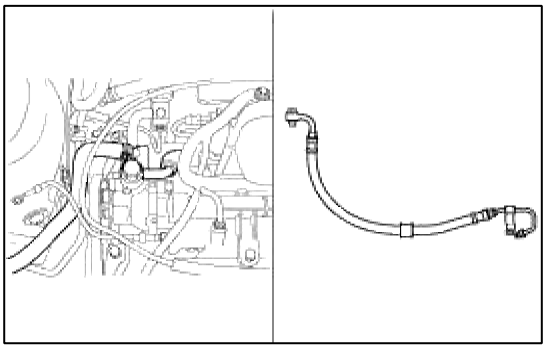
2. Insert the color tube from the front pump upper part to the lower part and install 2 mounting bolts.



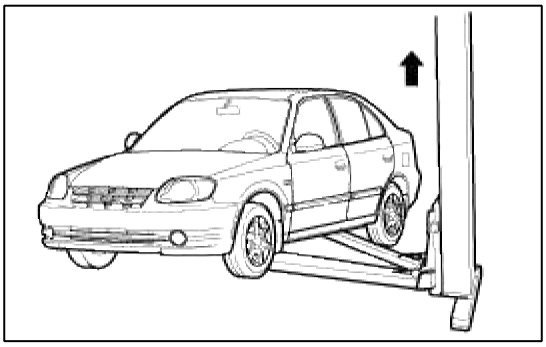
3. Connect the color tube to the power steering oil reservoir tank side hose, return tube and hose side and fix it with clips. (When installing the color tube)



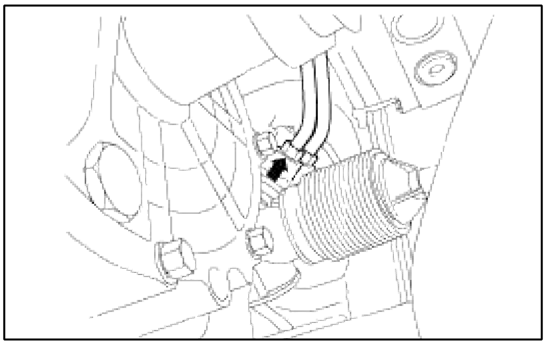
4. Place the pressure hose and tube assembly in position and connect it to the oil pump. (When installing the pressure hose and tube)



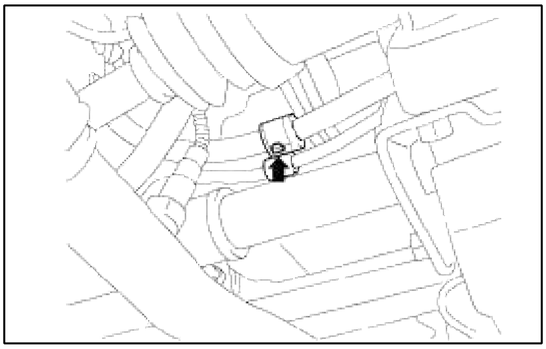
5. Raise the vehicle with a lift.



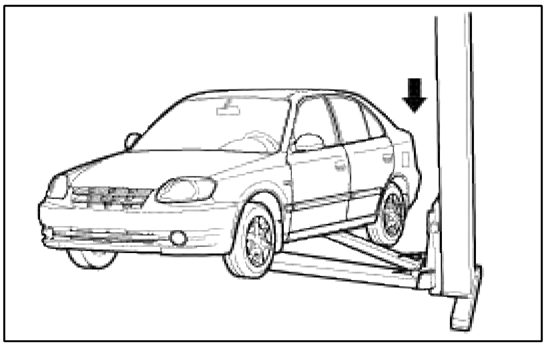
6. Fix the pressure tube and return tube fitting to the power steering gear box.



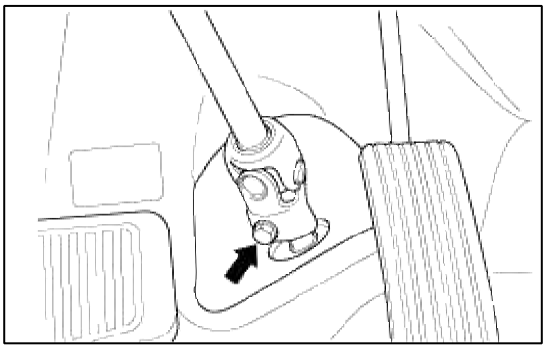
7. Fix the power steering pressure tube and return tube mounting clamp with a bolt.



8. Lower the vehicle.



9. Connect the gear box and steering column shaft universal joint in the passenger compartment.



10. Connect the tie rod end to the LH/RH knuckles.
11. Install the tires (LH/RH).
12. Fill the power steering oil reservoir with fluid.

INSPECTION

1. Twisting the hose by hand, check for cracks.
2. Check that the hose does not contact with other components.

HOW TO FILL WITH POWER STEERING FLUID

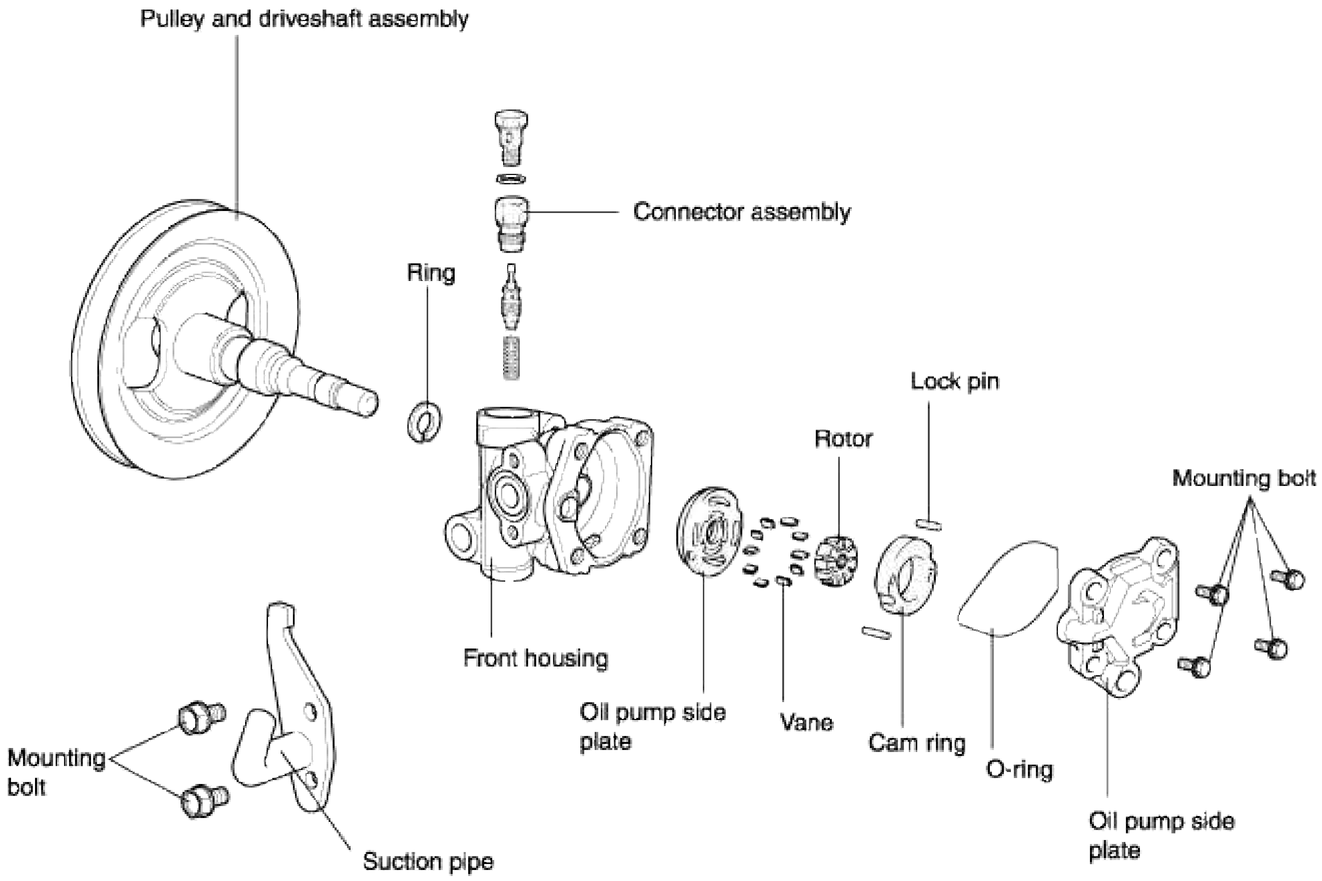
1. Fill the power steering reservoir with the power steering fluid to the "Max." position
2. Lift the front wheels with a jack and turn the steering wheel fully to the left and right 5~6 times at 13 rpm, while driving the pulley only by operating the start motor.
3. Start the engine, let it idle and turn the steering wheel fully left and right several times until bubbles disappear from the power steering reservoir.
4. If the oil color does not become milk-white and the oil level is constant at the "MAX" position, fluid level is O.K.

CAUTION

If the oil level changes when turning the steering wheel, and the oil overflows when stopping the engine, it shows that air bleeding wasn't performed perfectly. As it can cause noise and early damage, you must repeat the above procedures.

Steering System > Hydraulic Power Steering System > Power Steering Oil Pump > Components and Components Location

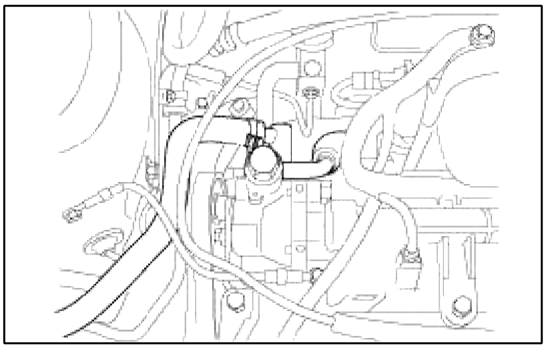
COMPONENTS


Pulley and driveshaft assembly
Connector assembly
Ring
Lock pin
Rotor
Mounting bolt
Front housing
Oil pump side plate
Vane
Cam ring
O-ring
Oil pump side plate
Mounting bolt
Suction pipe

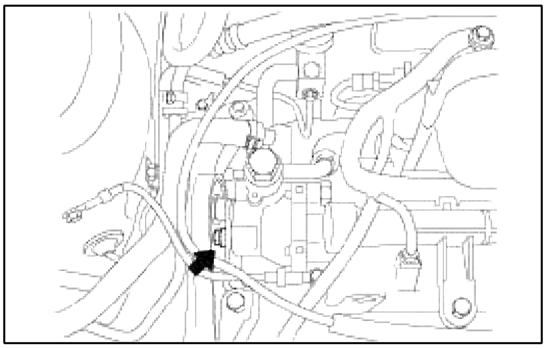
Steering System > Hydraulic Power Steering System > Power Steering Oil Pump > Repair procedures

REMOVAL

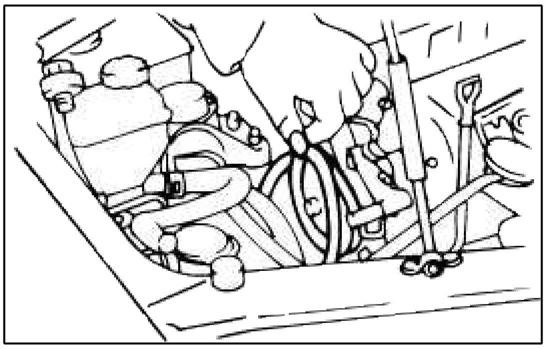
1. Remove the pressure hose from the oil pump.
   Disconnect the suction hose from the suction pipe and drain the fluid into a container.



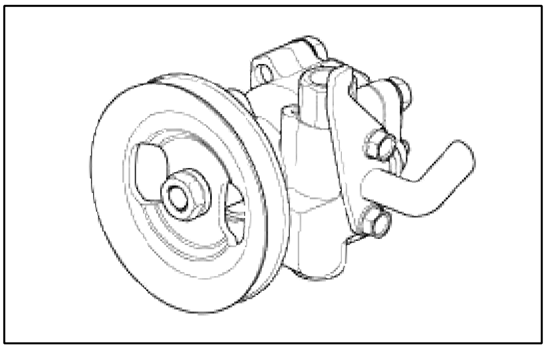
2. Loosen the power steering "V" belt tension adjusting bolt.



3. Remove the "V" belt from the power steering oil pump pulley.



4. After removing the power steering oil pump mounting bolts and the tension adjusting bolt, remove the power steering oil pump assembly.

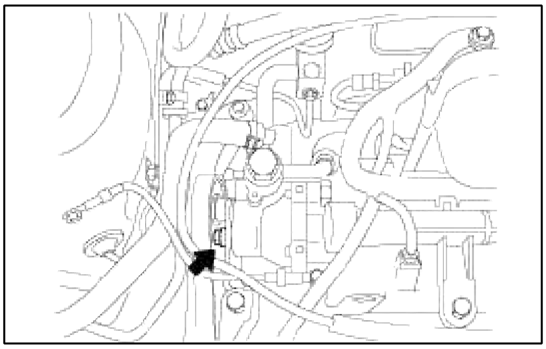


5. Remove the power steering oil pump mounting bracket.

INSTALLATION

1. After installing the oil pump to the oil pump bracket, install the "V" belt and tighten the bolt adjusting tension to the specified torque.

   Standard value
   Oil pump adjusting bolt:25~33 Nm (250~330 kg·cm, 18~24 lb·ft)

2. Install the suction hose.

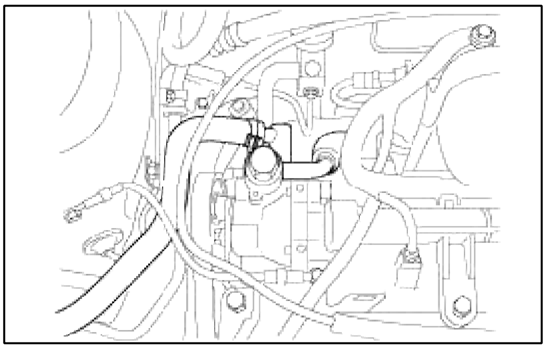
   CAUTION

   Install the pressure hose to the oil pump, facing the painted part on the hose toward the oil pump.

3. Install the pressure hose to the oil pump.

   NOTE

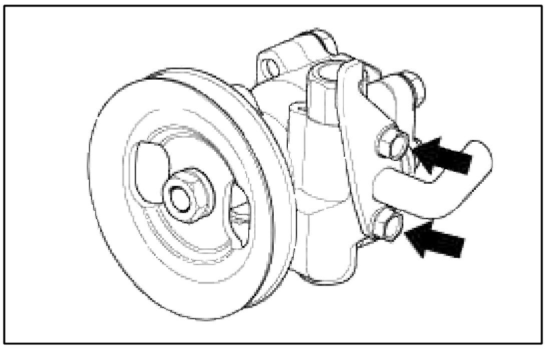
   Install the pressure hose being careful so that it does not twist and come in contact with other components.

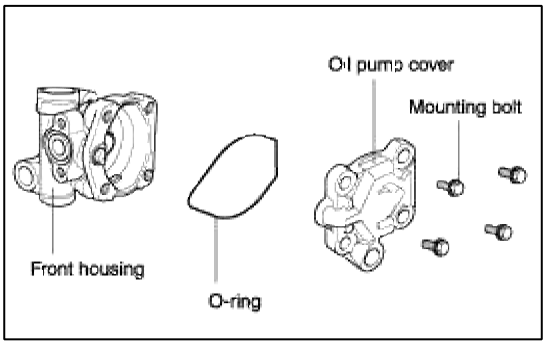
4. Add power steering fluid (PSF-3).
5. Air bleed the system.
6. Check the oil pump pressure.

DISASSEMBLY

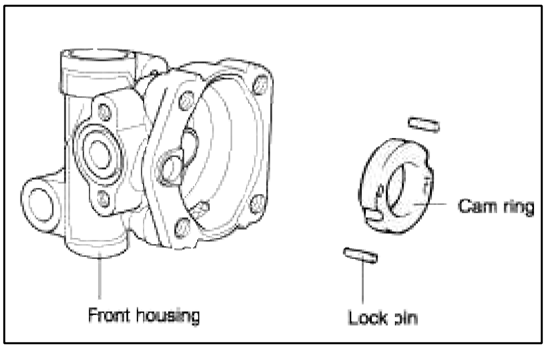
1. After removing the 2 bolts(10mm), remove the suction pipe and the O-ring from the oil pump body.

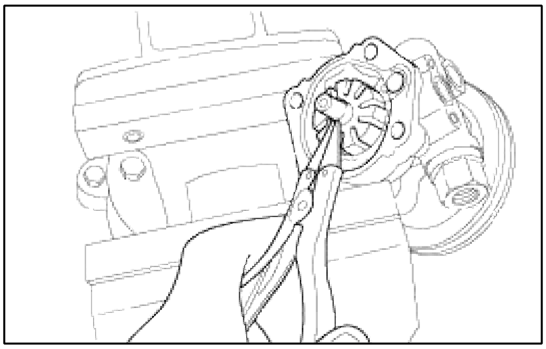
2. Loosen the four bolts(12mm) and remove the oil pump cover assembly.


Oil pump cover
Mounting bolt
Front housing
O-ring

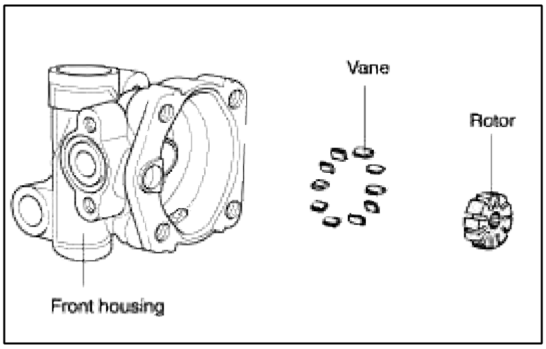
3. Remove the cam ring.


Cam ring
Front housing
Lock pin

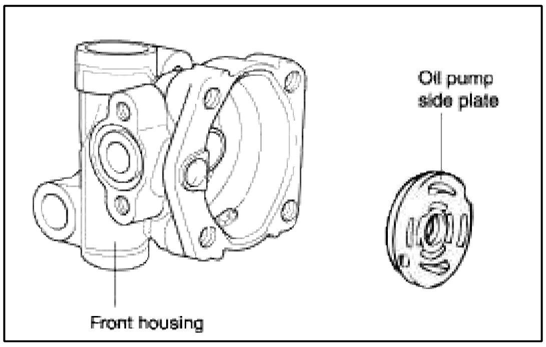
4. Remove the shaft fixing ring using snap ring pliers.



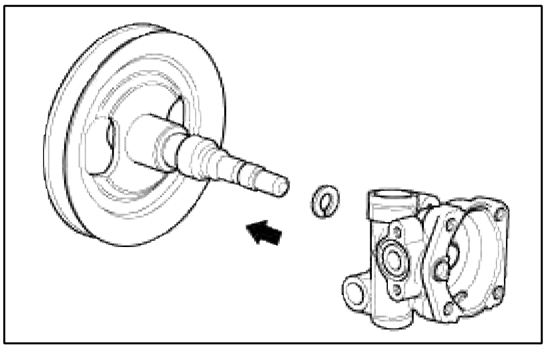
5. Remove the rotor and vanes.


Vane
Rotor
Front housing

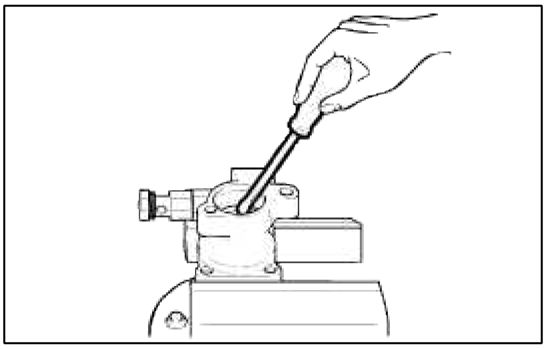
6. Remove the oil pump side plate.


Oil pump side plate
Front housing

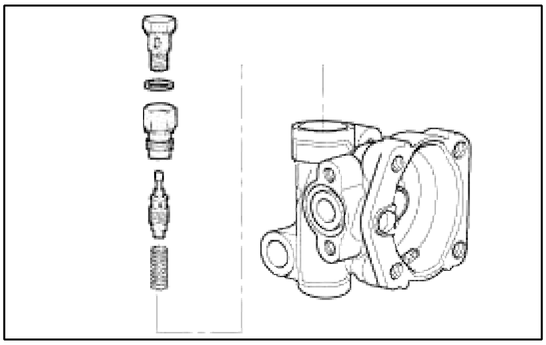
7. Remove the pulley and shaft assembly from the oil pump body.



8. Remove the oil seal from the oil pump body.



9. Remove the connector(24mm) from the oil pump body, and take out the flow control valve and the flow control spring.



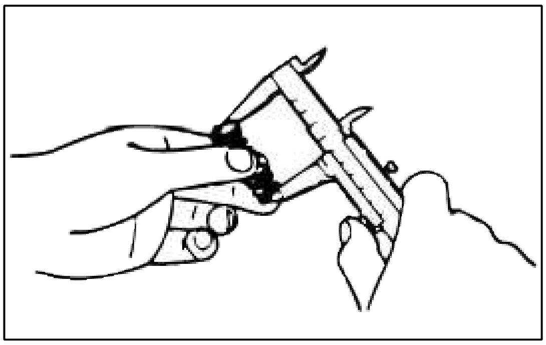
10. Remove the O-ring from the connector.

> **CAUTION**
>
> Do not disassemble the flow control valve.

INSPECTION

1. Check the free length of the flow control spring.

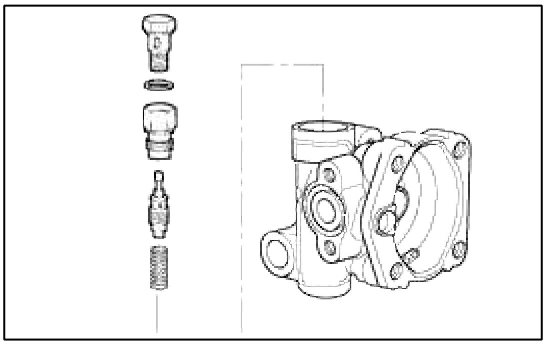
Free length of the flow control spring : 36.5mm



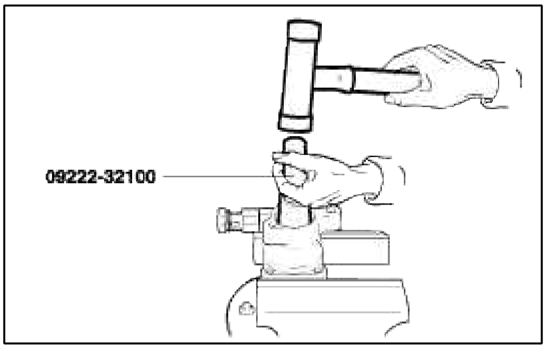
2. Check that the flow control valve is not bent.
3. Check the shaft for wear and damage.
4. Check the V-belt for wear and deterioration.
5. Check the grooves of the rotor and vanes for stratified abrasion.
6. Check the contact surface of the cam ring and vanes for stratified abrasion.
7. Check vanes for damage.
8. Check that there is no striped wear in the side plate or contacting part between the shaft and the pump cover surface.

REASSEMBLY

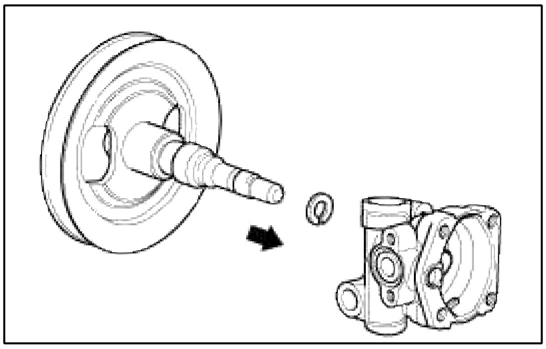
1. After installing the O-ring to the connector, install the flow control spring, the flow control valve and the connector into the pump body.



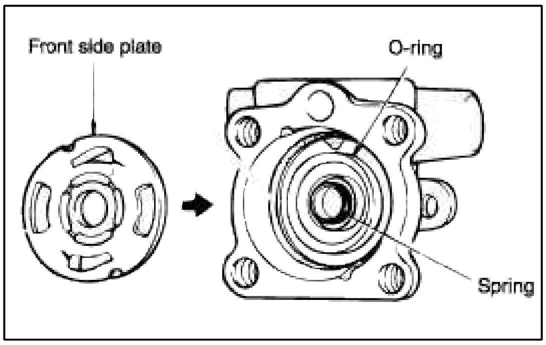
2. Install the oil seal in the pump body by using the special tool.



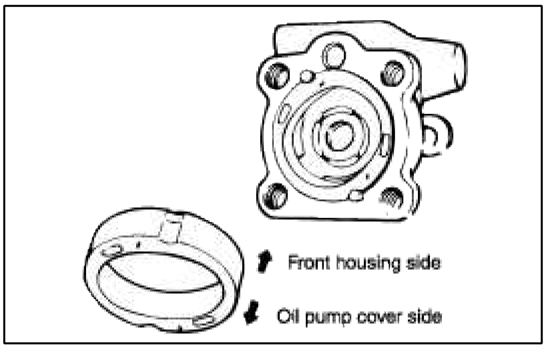
3. Install the pulley and shaft assembly to the oil pump body.



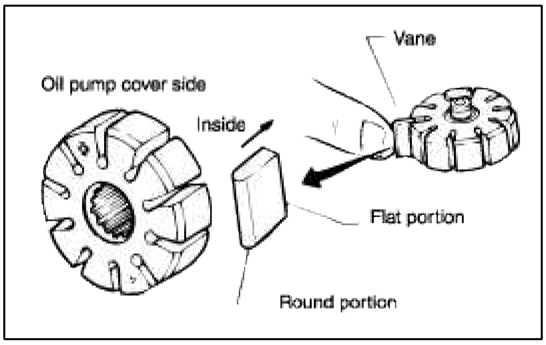
4. Install the oil pup side plate and rotor.



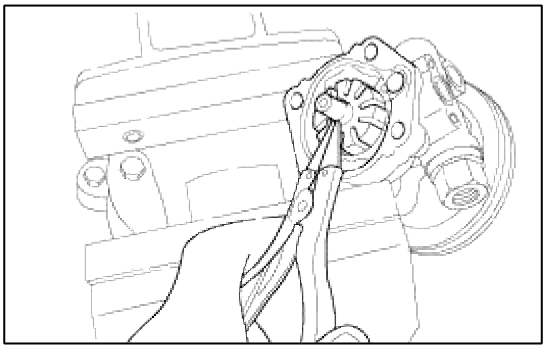
5. After inserting the lock pin into the groove of the front housing, install the cam ring attending to the direction.


Front housing side
Oil pump cover side

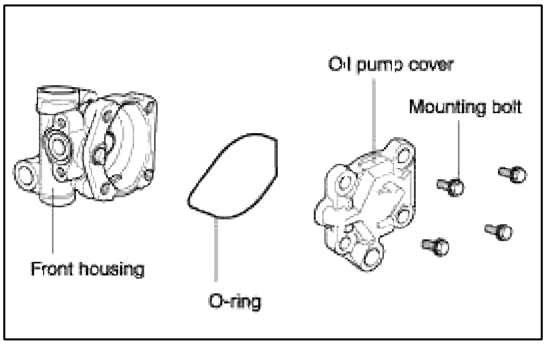
6. Install the rotor.
7. Install vanes so that the rounded edges face outward.


Vane
Oil pump cover side
Inside
Flat portion
Round portion

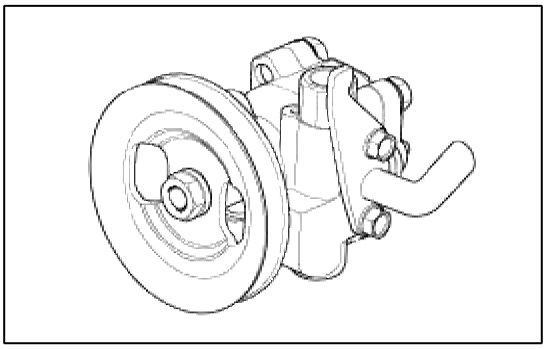
8. Install the shaft fixing clip with snap ring pliers.



9. Install the O-ring and oil pump cover assembly.


Oil pump cover
Mounting bolt
Front housing
O-ring

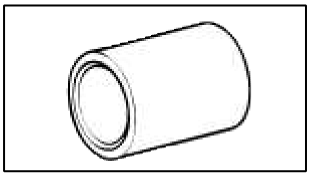
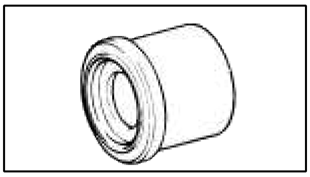
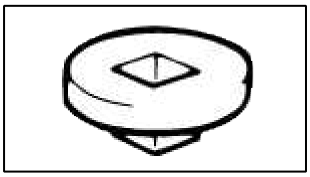
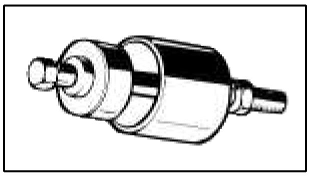
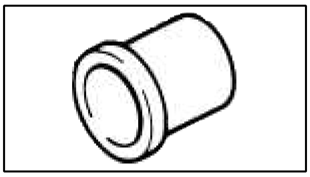
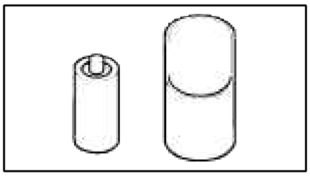
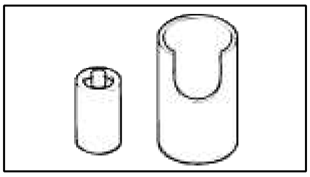
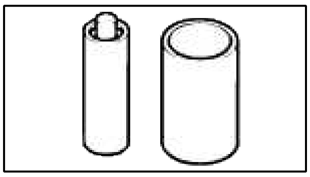
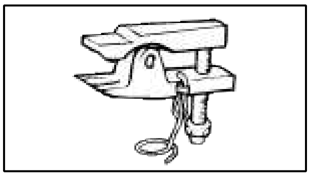
10. Install the suction pipe and O-ring.

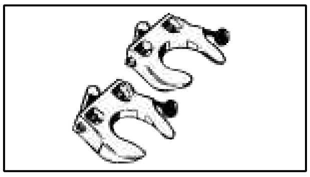
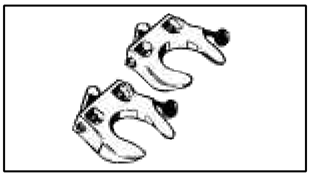
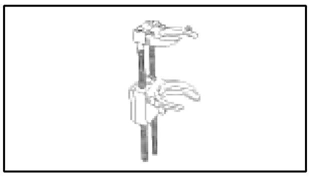
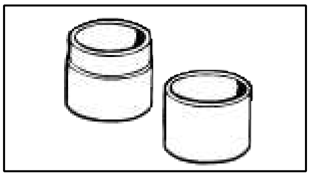
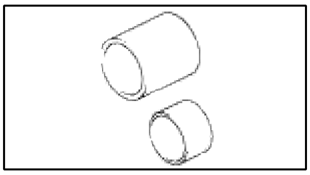


ACCENT(LC) > 2002 > G 1.5 SOHC > Suspension System

Suspension System > General Information > Special Service Tools

SPECIAL TOOLS

Tool (Number and Name)	Use	Illustration
09216-21100 Mount bushing remover		Removal & installation of lower arm bushing (G) (use with 09216-21200, 09545-02000)
09216-21200 Mount bushing remover and installer base		Removal & installation of the lower arm bushing (G) (use with 09216-21100, 09545-02000)
09532-11600 Preload socket		Measurement of the lower arm ball joint and stabilizer link starting torque
09545-02000 Lower arm bushing remover and installer		Installation of the lower arm ball joint
09545-21100 Ball joint dust cover installer		Installation of the lower arm ball joint snap ring
09545-25000 Lower arm bushing remover and installer		Removal & installation of the lower arm bushing (A)
09551-25000 Trailing arm bushing remover and installer		Removal & installation of the trailing arm bushing
09552-25000 Rear suspension arm remover and installer		Removal & installation of the rear suspension arm bushing
09568-34000 Ball joint puller		Separation of the lower arm ball joint

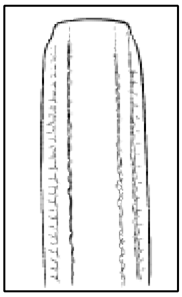
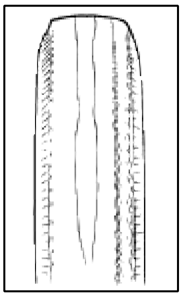
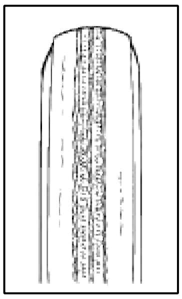
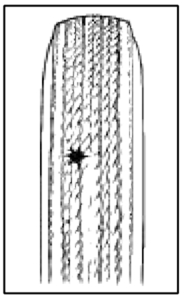
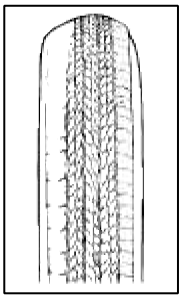
A-20 Strut compressor adapter		Compression of the rear coil spring (use with J38402)
A-42 Strut compressor adapter		Compression of front coil spring (use with J38402)
J38402 Strut spring compressor		Compression of the front & rear coil spring (use with A-42 or A-20)
09545-11000 (A,B) Ball joint remover and installer		Installation of the front lower arm ball joint
09545-3A000 Lower arm bushing remover		Removal of lower arm bushing

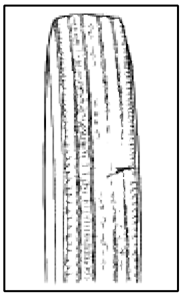
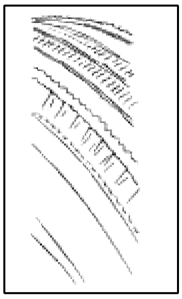
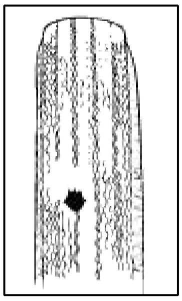
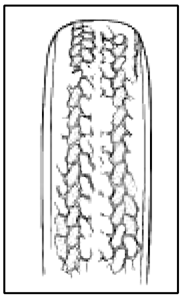
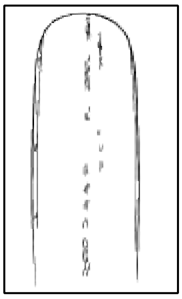
Suspension System > General Information > Troubleshooting

TROUBLESHOOTING

Symptom	Possible cause	Remedy
Hard steering	Improper front wheel alignment Excessive turning resistance of lower arm ball joint Low tire pressure No power assist	Correct Replace Adjust Repair and replace
Poor return of steering wheel to center	Improper front wheel alignment	Correct
Poor rough ride	Improper front wheel alignment Malfunctioning shock absorber Broken or worn stabilizer Broken or worn coil spring Worn lower arm bushing	Correct Repair or replace Replace Replace Replace the lower arm assembly
Abnormal tire wear	Improper front wheel alignment Improper tire pressure Malfunctioning shock absorber	Correct Adjust Replace
Wandering	Improper front wheel alignment Poor turning resistnace of lower arm ball joint Loose or worn lower arm bushing	Correct Repair Retighten or replace

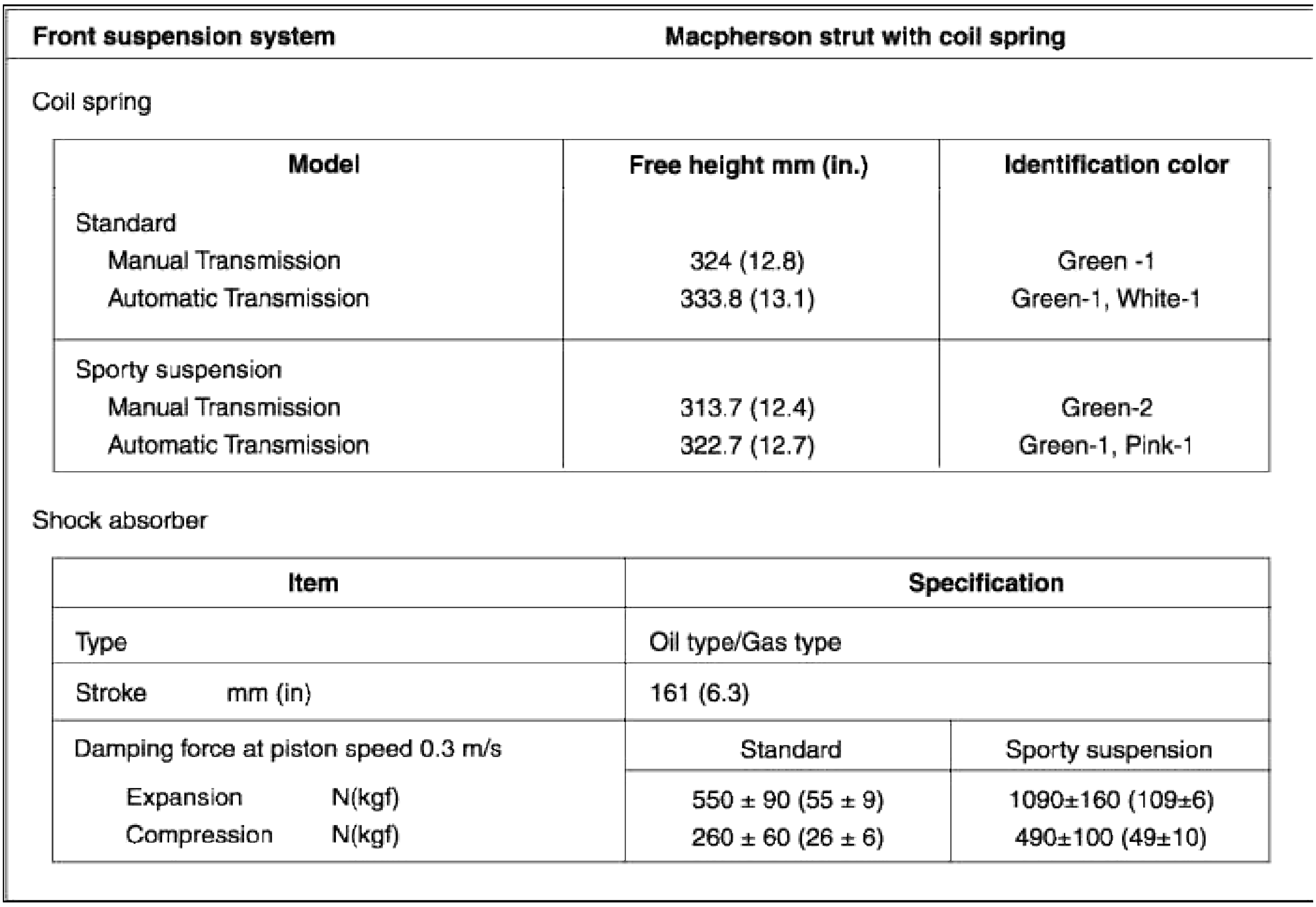
Vehicle pulls to one side	Improper front wheel alignment Excessive turning resistance of lower arm ball joint Broken or worn coil spring Bent lower arm	Correct Replace Replace Repair
Steering wheel shimmy	Improper front wheel alignment Poor turning resistance of lower arm ball joint Broken or worn stabilizer Worn lower arm bushing Malfunctioning shock absorber Broken or worn coil spring	Correct Replace Replace Replace Replace Replace
Bottoming	Broken or worn coil spring Malfunctioning shock absorber	Replace Replace

WHEEL AND TYPE DIAGNOSIS				
CENTER OF TREAD		BOTH SIDES OF TREAD WORN	CHUNKING OF TIRE	ONE SIDE OF TIRE WORN
				
Over-Inflation	Center-tread down to fabric due to excessive over-inflation	Under-Inflation Bulge at the shoulder Rapid wear	When a patch of tread has loosened, torn off the tire by centrifugal force at high speed	Incorrect camber angle

WHEEL AND TYPE DIAGNOSIS				
FLAT SPOT	FEATHERING	BAD PLUGGING	UNEVEN TIRE WEAR	TOTALLY UNSAFE TIRE
				
Caused by heavy braking which makes the wheels lock and scrubs tires along the road surface	Excessive toe-in toe-out	Using more than one plug distorts the tread, resulting in carcass failure	Bad wheel balance, fault in suspension, steering gear or bearing	Tread worn below the limit

Suspension System > General Information > Specifications

SPECIFICATIONS



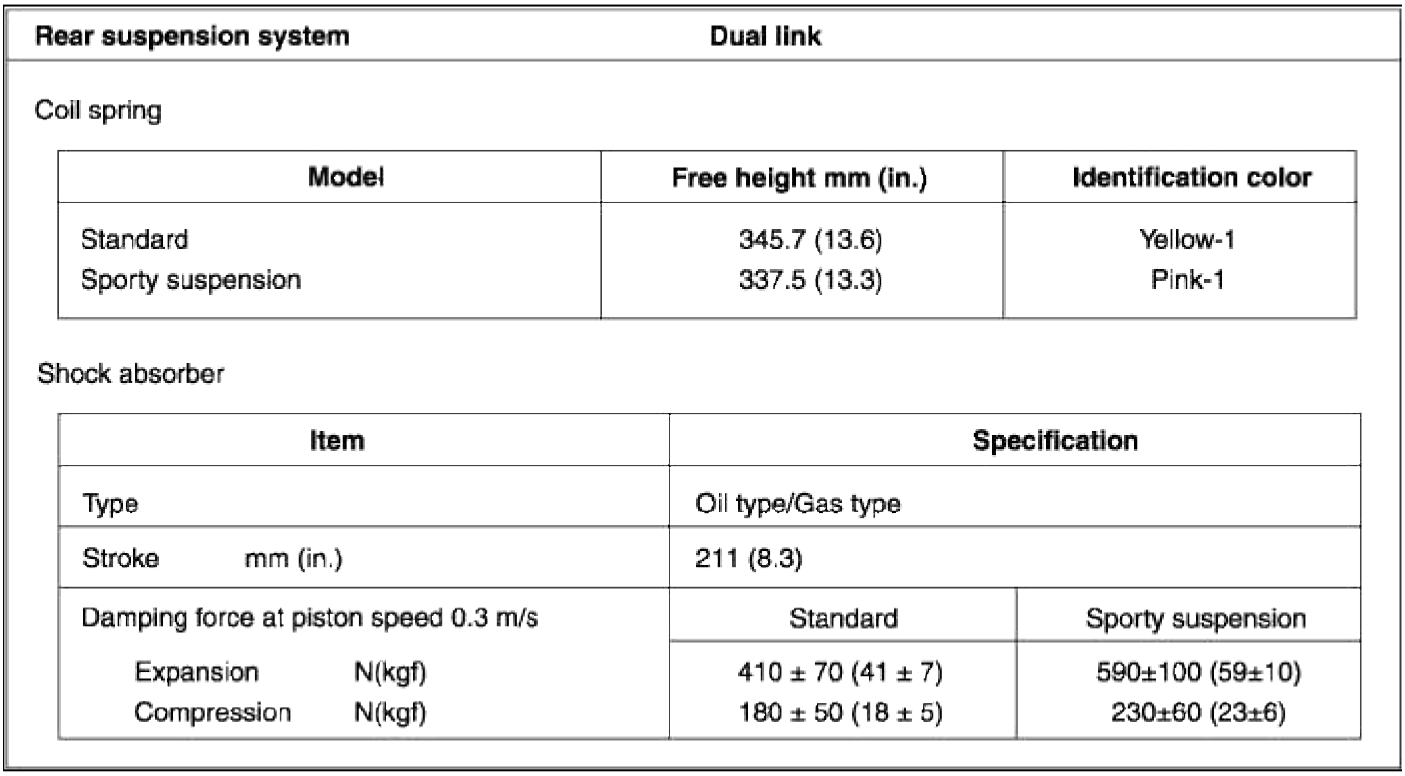
Front suspension system	Macpherson strut with coil spring

Coil spring

Model	Free height mm (in.)	Identification color
Standard		
Manual Transmission	324 (12.8)	Green -1
Automatic Transmission	333.8 (13.1)	Green-1, White-1
Sporty suspension		
Manual Transmission	313.7 (12.4)	Green-2
Automatic Transmission	322.7 (12.7)	Green-1, Pink-1

Shock absorber

Item	Specification	
Type	Oil type/Gas type	
Stroke mm (in)	161 (6.3)	
Damping force at piston speed 0.3 m/s	Standard	Sporty suspension
Expansion N(kgf)	550 ± 90 (55 ± 9)	1090±160 (109±6)
Compression N(kgf)	260 ± 60 (26 ± 6)	490±100 (49±10)



Rear suspension system	Dual link

Coil spring

Model	Free height mm (in.)	Identification color
Standard	345.7 (13.6)	Yellow-1
Sporty suspension	337.5 (13.3)	Pink-1

Shock absorber

Item	Specification	
Type	Oil type/Gas type	
Stroke mm (in.)	211 (8.3)	
Damping force at piston speed 0.3 m/s	Standard	Sporty suspension
Expansion N(kgf)	410 ± 70 (41 ± 7)	590±100 (59±10)
Compression N(kgf)	180 ± 50 (18 ± 5)	230±60 (23±6)

Tire size	P175/70 R13 185/60 HR14
Tire pressure kPa (psi)	207 (30)
Wheel size	Steel - 5J x 13, 5J x14 Al - 5J x 14 ('B' type)

SERVICE STANDARD

Standard value	Front	Rear
Toe-in mm(in.)	0 ± 3 (0 ± 0.12)	3 ± 2 (0.12 ± 0.0787)
Camber	0 ± 30′	-41′ ± 30′
Caster	1°48′ ± 30′	
King pin inclination angle	11°03′ ± 30′	
King pin offset mm(in.)	5.8 (0.23)	
Wheel runout Radial Axial	**Steel wheel** 0.6mm (0.028 in.) : Average of LH & RH 0.8mm (0.032 in.)	**Aluminum wheel** 0.3mm (0.012 in.) 0.3mm (0.012 in.)

TIGHTENING TORQUE

Items	Nm	kgf·cm	lb·ft
Castle nut Strut upper installation nut Strut assembly to knuckle Front strut mounting self locking nut Lower arm ball joint to knuckle Lower arm/lower arm bracket mounting bolt Tie rod end ball joint to knuckle Rear roll stopper to sub-frame bolt Rear roll stopper mounting nut Rear strut mounting self locking nut Rear stabilizer link to stabilizer bar Rear stabilizer bar bracket bolt Rear suspsension arm (A,B) to axle carrier Rear suspension arm (A) to body frame Rear suspension arm (B) to body frame	220-260 20-30 75-90 60-70 60-72 95-120 15-34 30-40 45-60 45-50 35-45 17-26 130-150 100-120 80-100 130-150 100-120 40-50	2200-2600 200-300 750-900 600-700 600-720 950-1200 150-340 300-400 450-600 450-500 350-450 170-260 1300-1500 1000-1200 800-1000 1300-1500 1000-1200 400-500	162-192 14-22 55-66 43-51 43-52 69-87 11-25 22-29 33-44 33-37 26-33 13-19 96-110 74-88 59-74 96-110 74-88 30-37

Trailing arm to axle carrier nut Trailing arm to bracket nut Trailing bracket to body frame			

CAUTION

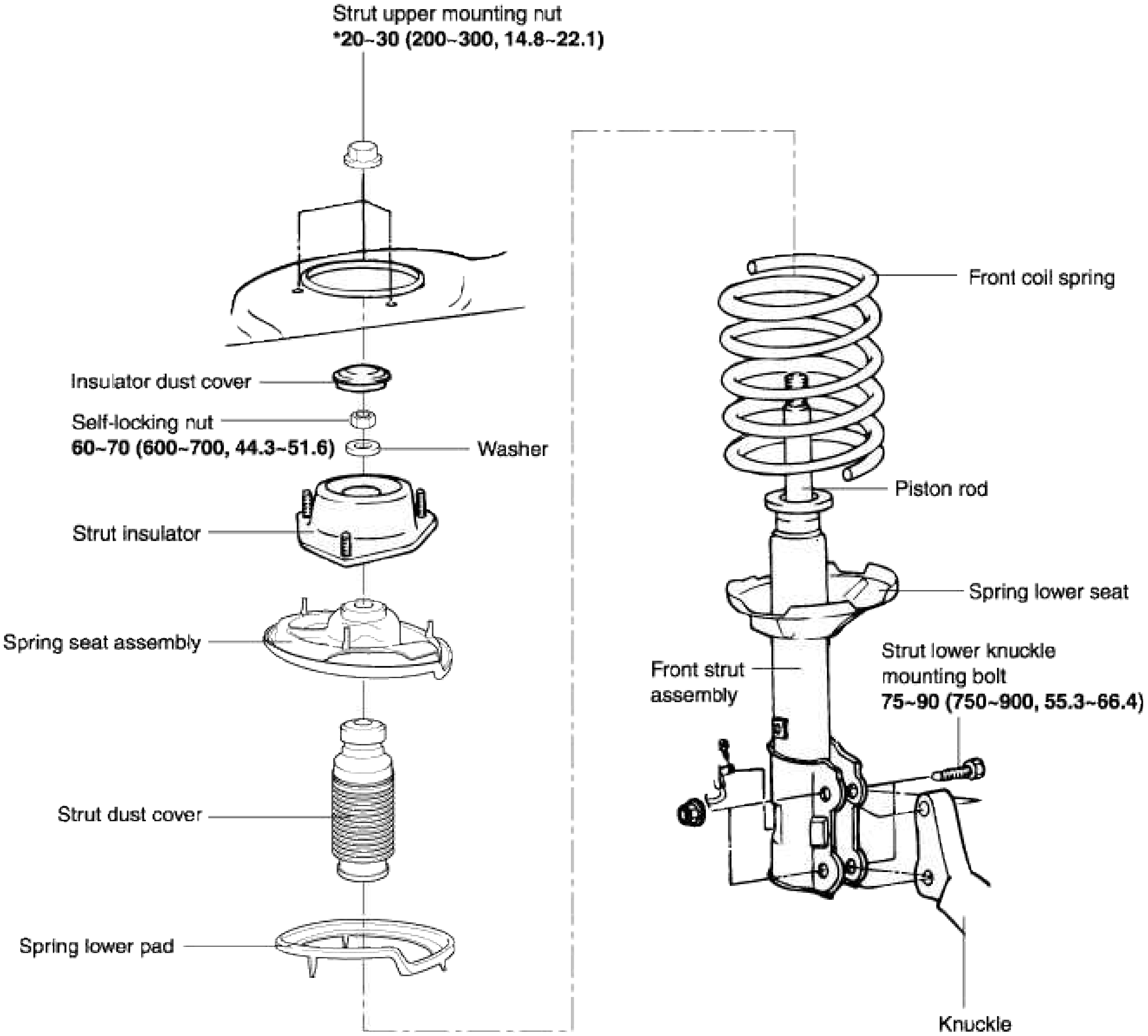
Replace the self-locking nuts with new ones after removal.

LUBRICANTS

Location	Recommended lubricant	Quantity
In ball joint of lower arm	Variant R-2 grease or poly lub gly 801 K	As required
In insulator bearing strut	SAE J310a, Chassis grease (NLGI No. 0 or equivalent)	As required
In rear statilizer link case	Lubchem SB 6042M or Sunlight MB2	As required

Suspension System > Front Suspension System > Front Strut Assembly > Components and Components Location

COMPONENTS


Strut upper mounting nut
*20~30 (200~300, 14.8~22.1)
Insulator dust cover
Self-locking nut
60~70 (600~700, 44.3~51.6)
Washer
Strut insulator
Spring seat assembly
Strut dust cover
Spring lower pad
Front coil spring
Piston rod
Spring lower seat
Front strut assembly
Strut lower knuckle mounting bolt
75~90 (750~900, 55.3~66.4)
Knuckle

CAUTION

* **Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in an unladen condition.**

TORQUE : Nm (kgf·cm, lbf·ft)

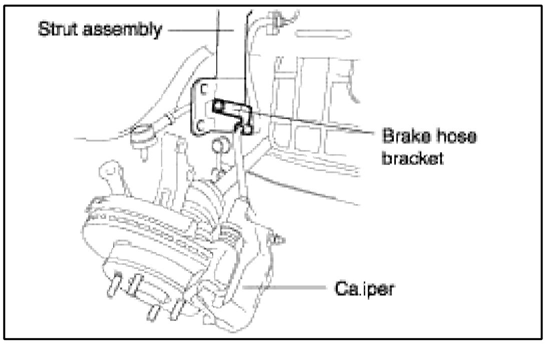
Suspension System > Front Suspension System > Front Strut Assembly > Repair procedures

REMOVAL

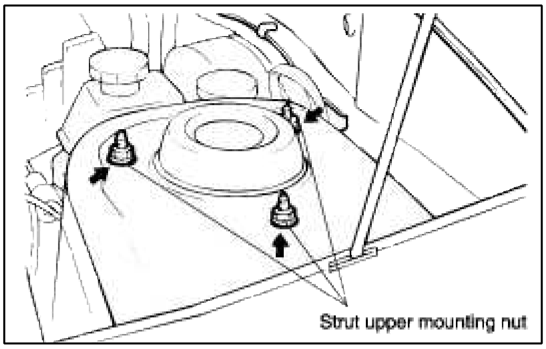
1. Remove the front wheel.

2. Detach the brake hose bracket from the strut assembly.

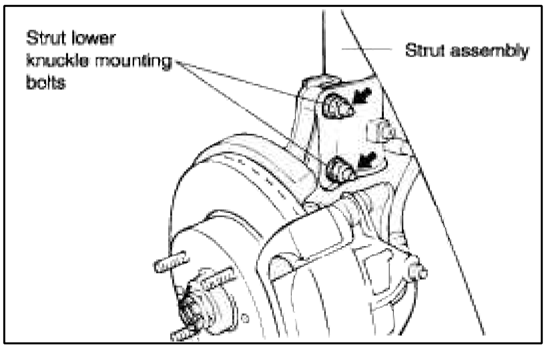
> **NOTE**
>
> Do not pry or force the components excessively.


Strut assembly
Brake hose bracket
Caliper

3. Remove the strut upper mounting nuts(3).


Strut upper mounting nut

4. Remove the strut lower kunckle mounting bolts(2).


Strut lower knuckle mounting bolts
Strut assembly

5. Remove the strut assembly.
6. Installation is the reverse of removal.

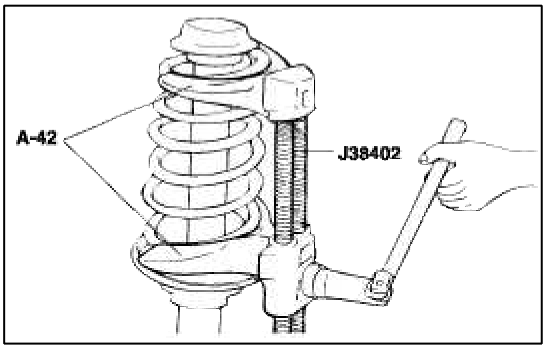
DISASSEMBLY

1. Remove the insulator dust cover with a flat-tip screw driver.

2. Using the Special Tool(J38402), compress the coil spring until there is only a little tension on the strut.

NOTE

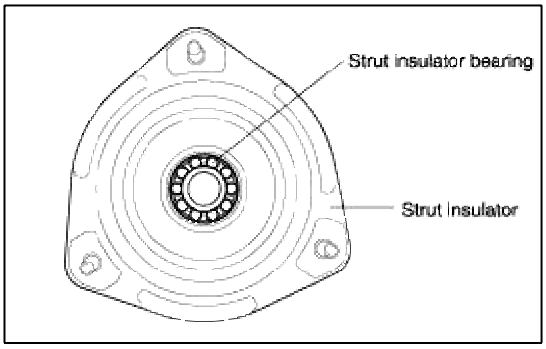
Do not use an impact gun.



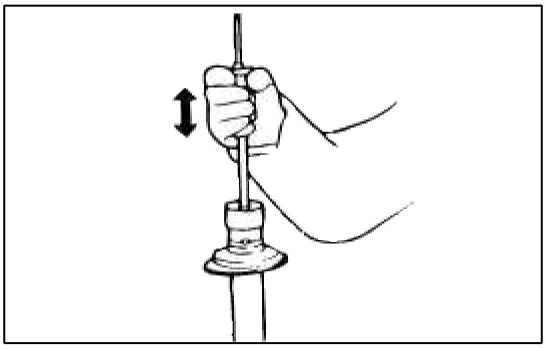
3. Remove the lock-nut at the top end of the shock absorber.
4. Remove the strut insulator, spring seat assembly, coil spring and strut dust cover.

INSPECTION

1. Check the strut insulator bearing for wear or damage.

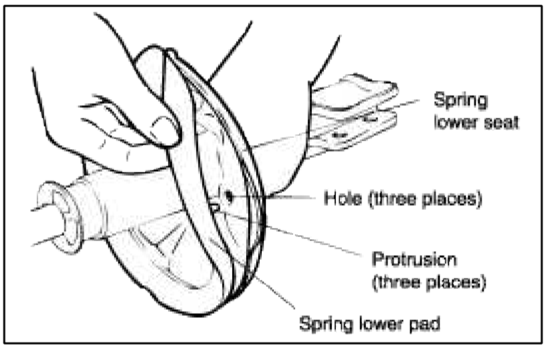


2. Check the rubber parts (Insulator dust cover, Strut insulator, Spring seat assembly, Strut dust cover, Spring lower pad) for damage or deterioration.
3. Check the coil spring for sagging and weakness.
4. Reassemble all the parts except for the coil spring.
5. Repeat pushing and pulling of the damper assembly as shown.
6. Check for smooth operation through a full stroke.
   If there is no compression, no extension and the gas is leaking, it is strongly recommended that the damaper should be replaced.



REASSEMBLY

1. Install the spring lower pad with the protrusions fitted in the holes of the spring lower seat.

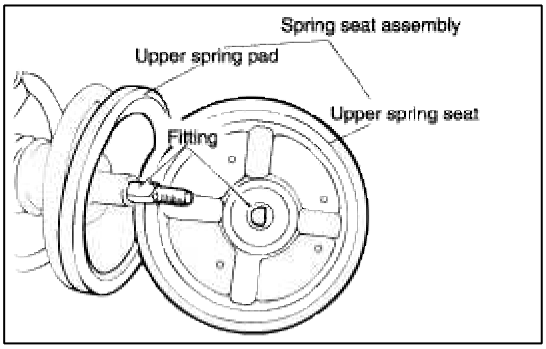

Spring lower seat
Hole (three places)
Protrusion (three places)
Spring lower pad

2. Install the strut dust cover on the shock absorber.
3. Using Special Tool(J38402, A-42), compress the coil spring.
   After the spring is fully compressed, install it on the shock absorber.

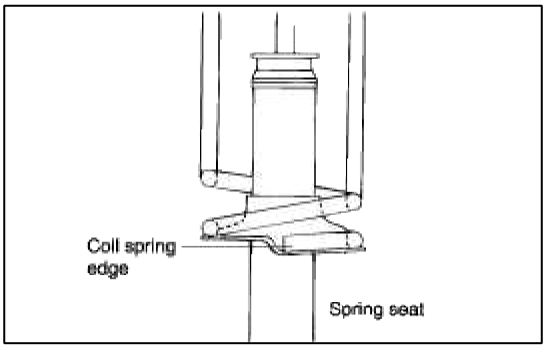
> NOTE
>
> Install the coil spring with the identification color mark facing toward the knuckle.

4. After fully extending the piston rod, install the spring seat assembly and the strut insulator.

> NOTE
>
> Align the D-shaped hole in the spring seat assembly with the indentation on the piston rod.


Spring seat assembly
Upper spring pad
Upper spring seat
Fitting

5. After having correctly seated the upper and lower ends of the coil spring in the upper and lower spring seat grooves, install the new self-lockingnut but do not tighten it.


Coil spring edge
Spring seat

6. Remove the Special Tool (J38402, A-42).
7. Tighten the self-locking nut to the specified torque.

Tightening torque
60-70 Nm (600-700 kg·cm, 43-51 lb·ft)

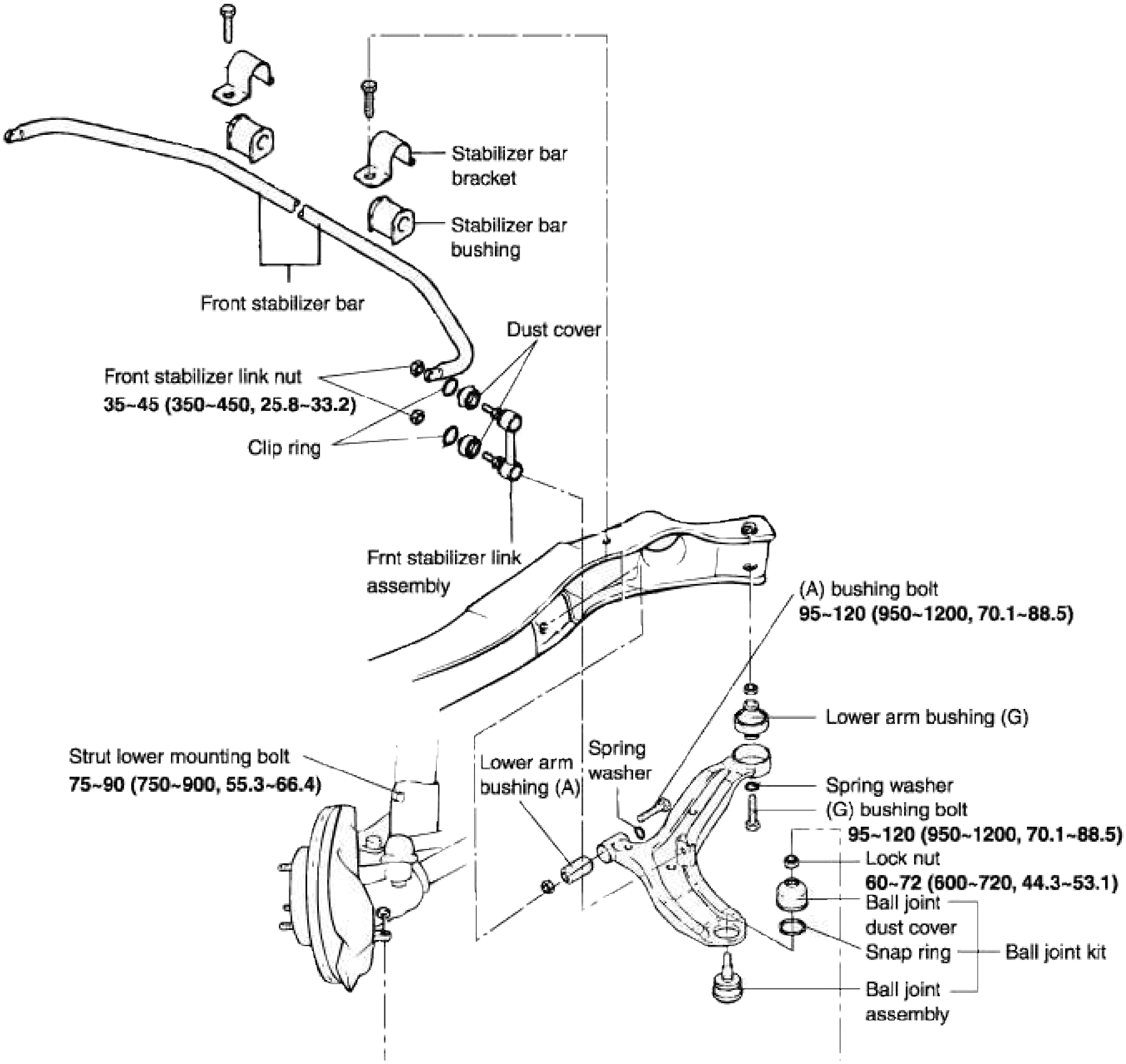
---

8. Pack grease in the strut insulatior bearing and install the insulator dust cover.

> **CAUTION**
>
> Make sure that no grease is on the insulator rubber. (refer to 'LUBRICANTS', SS-p.3).

Suspension System > Front Suspension System > Front Lower Arm > Components and Components Location

COMPONENTS

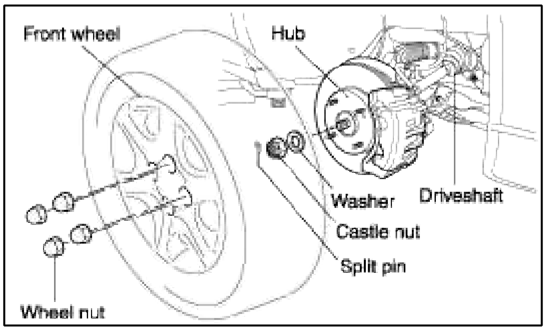

Stabilizer bar bracket
Stabilizer bar bushing
Front stabilizer bar
Dust cover
Front stabilizer link nut
35~45 (350~450, 25.8~33.2)
Clip ring
Frnt stabilizer link assembly
(A) bushing bolt
95~120 (950~1200, 70.1~88.5)
Lower arm bushing (G)
Strut lower mounting bolt
75~90 (750~900, 55.3~66.4)
Lower arm bushing (A)
Spring washer
Spring washer
(G) bushing bolt
95~120 (950~1200, 70.1~88.5)
Lock nut
60~72 (600~720, 44.3~53.1)
Ball joint dust cover
Snap ring
Ball joint kit
Ball joint assembly

TORQUE : Nm (kgf·cm, lbf·ft)

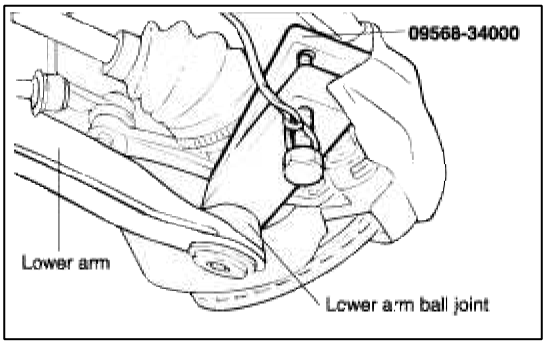
Suspension System > Front Suspension System > Front Lower Arm > Repair procedures

REMOVAL

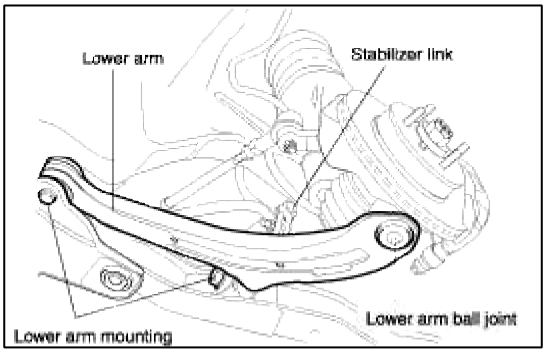
1. Remove the front wheel and tire.
2. Remove the split pin, the castle nut and the washer.


Front wheel
Hub
Washer
Driveshaft
Castle nut
Split pin
Wheel nut

3. Loosen the lower arm ball joint nut, but do not remove it.
4. Remove the strut lower mounting bolts(2).
5. Push the axle hub outward to disconnect the drive shaft from the axle hub.
6. Using the Special Tool(09568-34000), disconnect the lower arm ball joint from the lower arm.


09568-34000
Lower arm
Lower arm ball joint

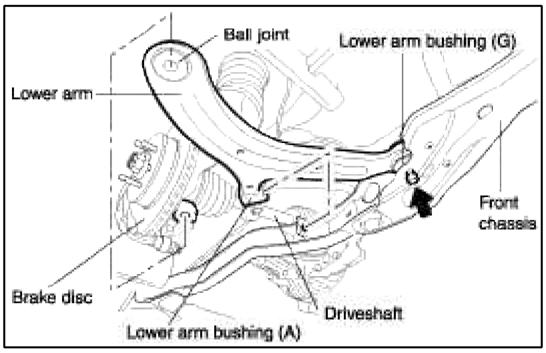
7. Install the strut lower mounting bolt temporarily.
8. Remove the stabilizer link nut.
9. Remove the lower arm bushing (A) and bushing (G) mounting bolts(2).


Lower arm
Stabilizer link
Lower arm mounting
Lower arm ball joint

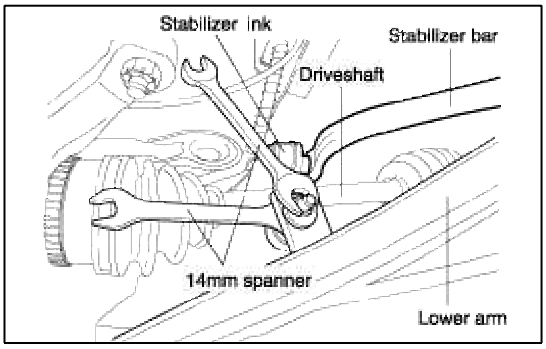
10. Remove the lower arm assembly.

INSTALLATION

1. First, fix the lower arm bushing (G) and then bolt up slightly.


Ball joint
Lower arm bushing (G)
Lower arm
Front chassis
Brake disc
Driveshaft
Lower arm bushing (A)

2. It would be better to insert the driveshaft spline and the ball joint in the knuckle nearly at the same time.
3. Install the stabilizer link in the lower arm assembly the moment the driveshaft is inserted gradually.
   Do not, however, tighten the self-locking nut in this step.
4. Push the brake disc and hub inward in order to assemble the lower arm bushing (A) to the front chassis.
5. Tighten the lower arm bushing (A) bolt.
6. Tighten the lower arm bushing (G) bolt completely.
7. After fixing the stabilizer link using 14mm spanner, tighten the self-locking nut.

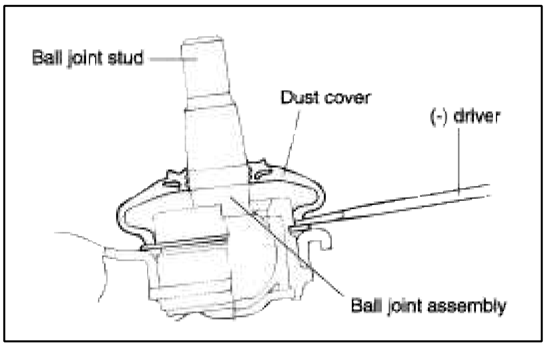

Stabilizer link
Stabilizer bar
Driveshaft
14mm spanner
Lower arm

8. Assemble the washer, castle nut and split pin.
9. Install the wheel and tire.

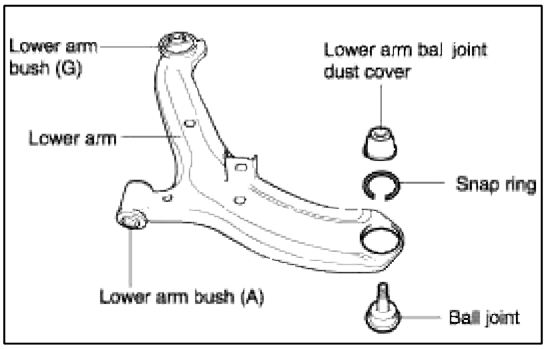
DISASSEMBLY

BALL JOINT AND DUST COVER REPLACEMENT

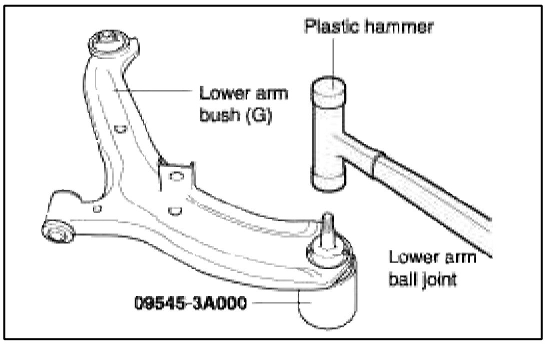
1. Using a screwdriver, remove the dust cover from the lower arm ball joint.


Ball joint stud
Dust cover
(-) driver
Ball joint assembly

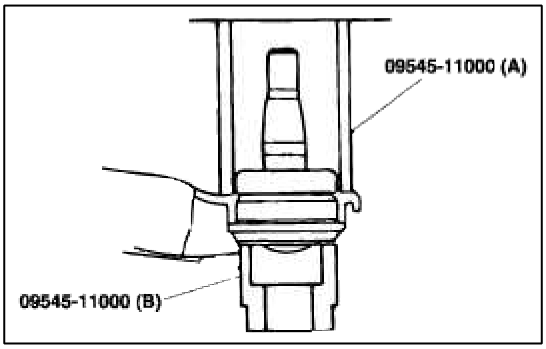
2. Remove the snap ring.


Lower arm bush (G)
Lower arm ball joint dust cover
Lower arm
Snap ring
Lower arm bush (A)
Ball joint

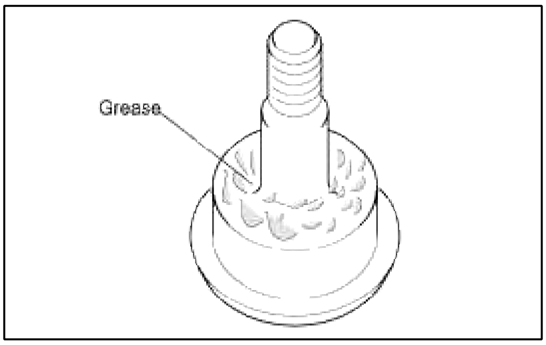
3. Using a plastic hammer, disconnect the ball joint from the lower arm.
   Hammering with the special tool(09545-3A000) placed under the lower arm as shown may prevent the deformation of the lower arm.


Plastic hammer
Lower arm bush (G)
Lower arm ball joint
09545-3A000

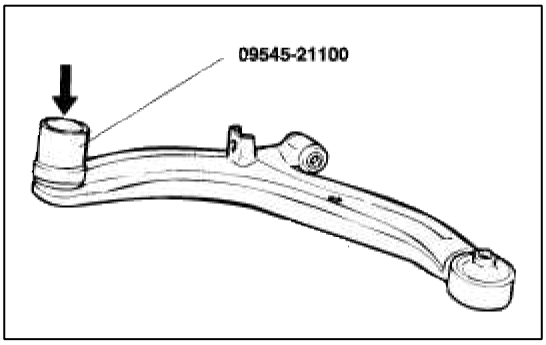
4. Using Special Tool(09545-11000), press the ball joint into the lower arm assembly.
   Unless it it pressed firmly, the snap ring will not fit perfectly to the groove.


09545-11000 (A)
09545-11000 (B)

5. Install the snap ring.
6. If there is not sufficient grease on the ball joint assembly, apply grease abundantly.



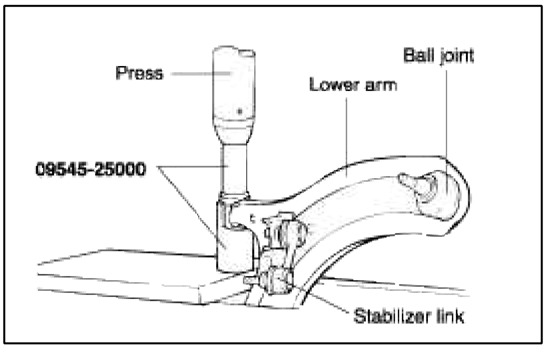
7. Using special tool(09545-21100), install the dust cover. The Special Tool will make the installation process even easier.


09545-21100

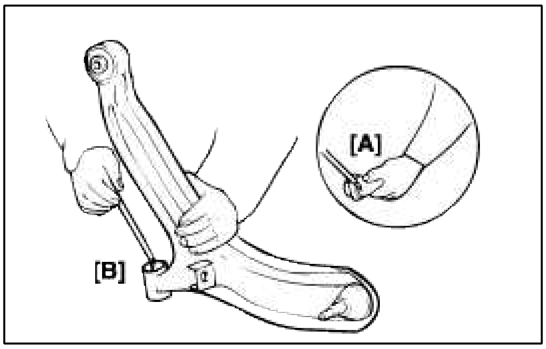
LOWER ARM BUSHING (A) REPLACEMENT

1. Install the Special Tool(09545-25000) and the lower arm on the press-machine.

2. Remove the bushing (A).



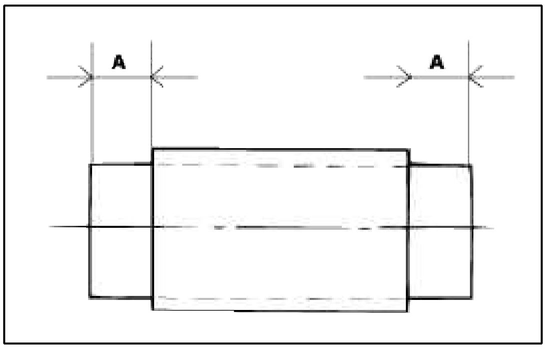
3. Apply soap solution to the following parts.
   - A. Outer surface of the new bushing (A).
   - B. Inner surface of the lower arm bushing mount (B).



4. Install the new bushing onto the lower arm by using special tool.
5. Center the bushing by using by the following procedure, if necessary.
   - A. Reset the Special Tool and lower arm.
   - B. Center the bushing.

NOTE

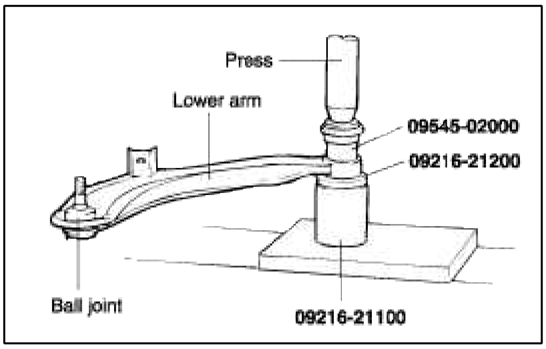
After centering the bushing, wipe off the soap solution.



LOWER ARM BUSHING (G) REPLACEMENT

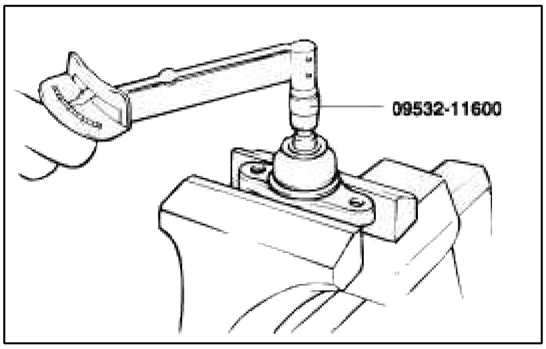
1. Install the Special Tool(09216-21100, 09216-21200, 09545-02000) and the lower arm.
2. Press out the bushing (G).
3. Apply soap solution to the following parts.
   - A. Outer surface of the bushing
   - B. Inner surface of the lower arm bushing mount.

4. Install the new bushing onto the lower arm by using Special Tool. (09216-21100, 09216-21200, 09545-02000)



INSPECTION

1. Check the bushing for wear and deterioration.
2. Check the lower arm for bending or breakage.
3. Check the ball joint dust cover for cracks.
4. Check all bolts.
5. Check the lower arm ball joint for rotating torque.



A. If a crack is noted in the dust cover, replace the ball joint assembly.

B. Shake the ball joint stud several times. (See page SS-p.12)

C. Measure the balll joint rotating torque.

Standard value

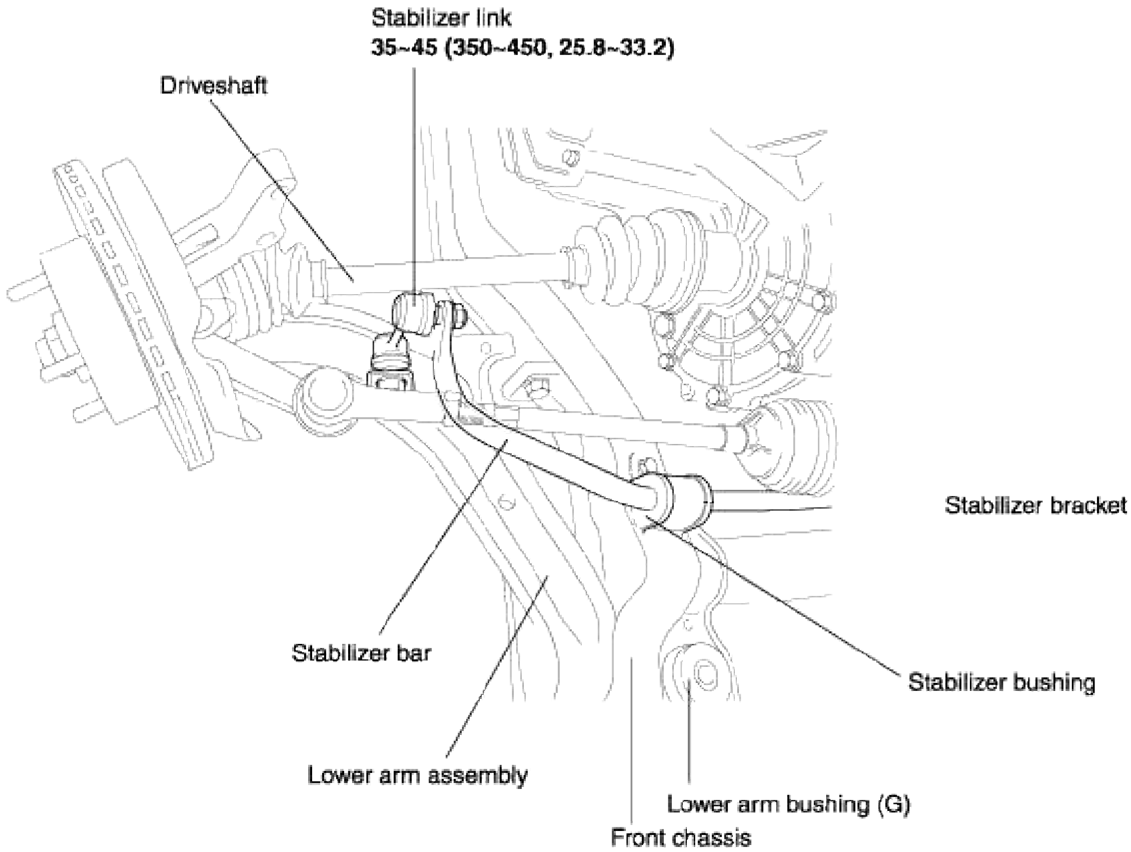
2.5-9 Nm (25-90 kg·cm, 1.8-6.6 lb·ft)

D. If the rotating torque exceeds the upper limit of the standard value, replace the ball joint assembly.

E. Even if the rotating torque is below the lower limit of the standard value, the ball joint may be reused, unless it has drag and excessive play.

Suspension System > Front Suspension System > Front Stabilizer Bar > Components and Components Location

COMPONENTS

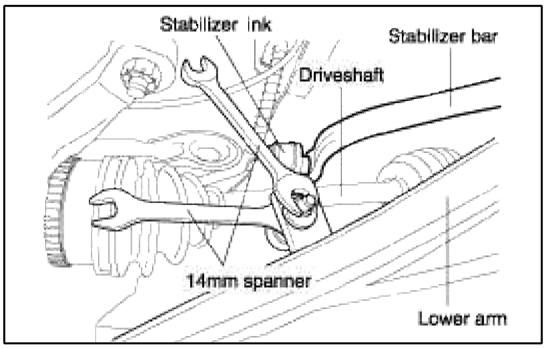

Stabilizer link
35~45 (350~450, 25.8~33.2)
Driveshaft
Stabilizer bracket
Stabilizer bar
Stabilizer bushing
Lower arm assembly
Lower arm bushing (G)
Front chassis

TORQUE : Nm (kgf·cm, lbf·ft)

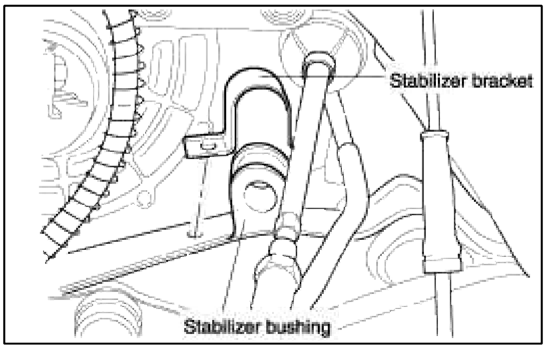
Suspension System > Front Suspension System > Front Stabilizer Bar > Repair procedures

REMOVAL

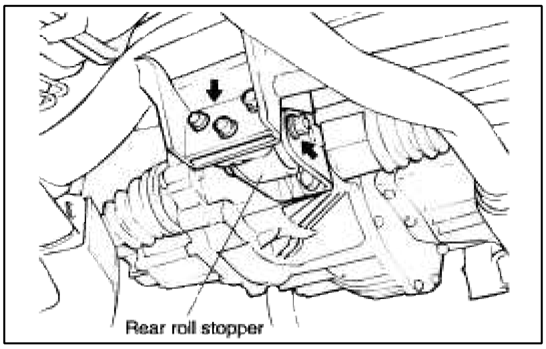
1. Remove the front wheel.
2. Remove the stabilizer link assembly.


Stabilizer link
Stabilizer bar
Driveshaft
14mm spanner
Lower arm

3. Remove the stabilizer bracket and bushing.


Stabilizer bracket
Stabilizer bushing

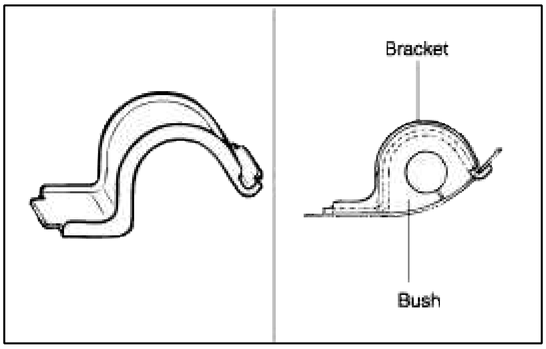
4. Remove the rear roll stopper.



5. Remove the stabilizer bar.

INSTALLATION

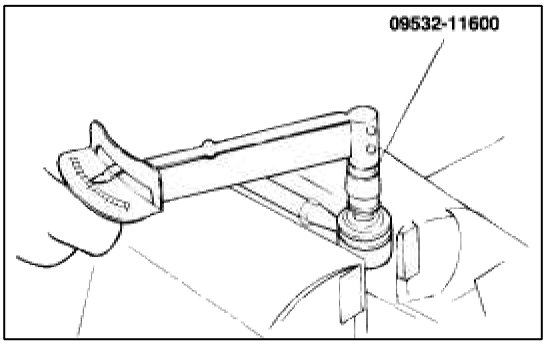
1. Install the bushing onto the stabilizer bar.
2. Align the bracket with the bushing.
   Make sure the projections are securely in the space of the bracket.



3. Using the access opening, temporarily tighten the bushing fixtures then position the bushing on the opposite side.
4. Secure the stabilizer link with a open-end wrench (14 mm) then install the self locking nut.

INSPECTION

1. Check the stabilizer bar for deterioration and damage.
2. Check all bolts for condition and straightness.
3. Check the stabilizer link dust cover for cracks or damage.
4. Check the stabilizer link ball joint rotating torque.



   A. If there is a crack in the dust cover, replace it and add grease.
   B. Shake the stabilizer link ball joint stud several times.
   C. Mount the self-locking nut on the ball joint, and then measure the ball jointrotating torque.

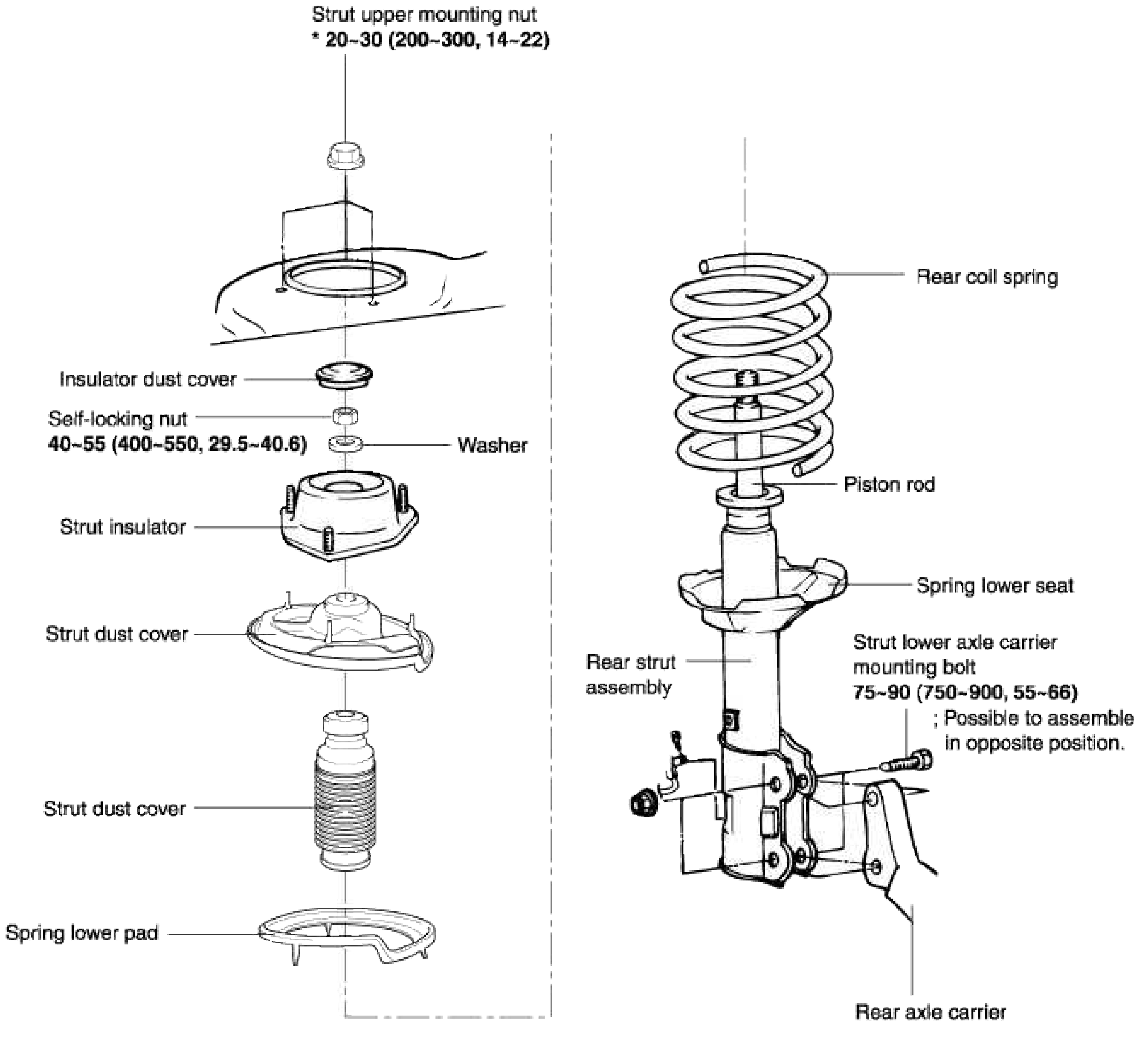
Standard value
1.7-3.2 Nm (17-32 kc·gm, 1.3-2.4 lb·ft)

   D. If the rotating torque exceeds the upper limit of the standard value, replacethe stabilizer link.

E. Even if the rotating torque is below the lower limit of the standard value, the ball joint may be reused unless it has drag and excessive play.

Suspension System > Rear Suspension System > Rear Strut Assembly > Components and Components Location

COMPONENTS


Strut upper mounting nut
* 20~30 (200~300, 14~22)
Insulator dust cover
Self-locking nut
40~55 (400~550, 29.5~40.6)
Washer
Strut insulator
Strut dust cover
Strut dust cover
Spring lower pad
Rear coil spring
Piston rod
Spring lower seat
Strut lower axle carrier
mounting bolt
75~90 (750~900, 55~66)
; Possible to assemble
in opposite position.
Rear strut
assembly
Rear axle carrier

CAUTION

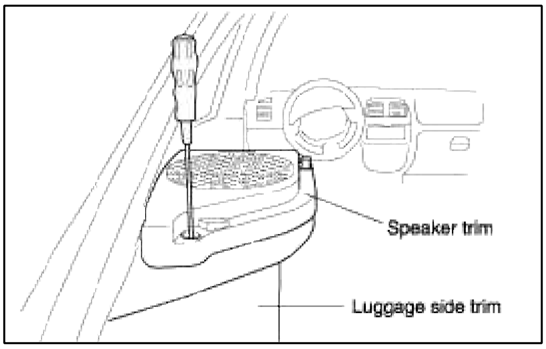
* **Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in an unladen condition.**

TORQUE : Nm (kgf·cm, lbf·ft)

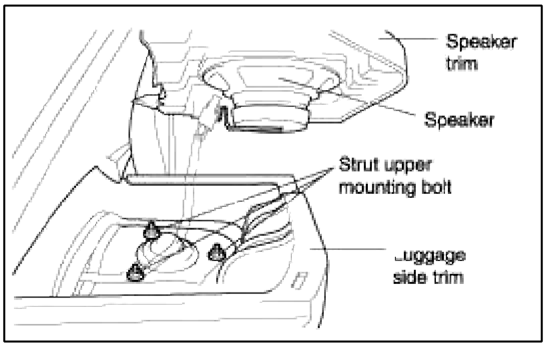
Suspension System > Rear Suspension System > Rear Strut Assembly > Repair procedures

REMOVAL

1. Fold down the rear seat back assembly.
2. Remove the speaker trim and the luggage side trim.


Speaker trim
Luggage side trim

3. Remove the rear strut upper mounting nuts(3).


Speaker trim
Speaker
Strut upper mounting bolt
Luggage side trim

4. Remove the wheel and tire.
5. Disconnect the brake hose and wheel speed sensor wiring from the rear strut.
6. Remove the strut and carrier mounting bolts(2).

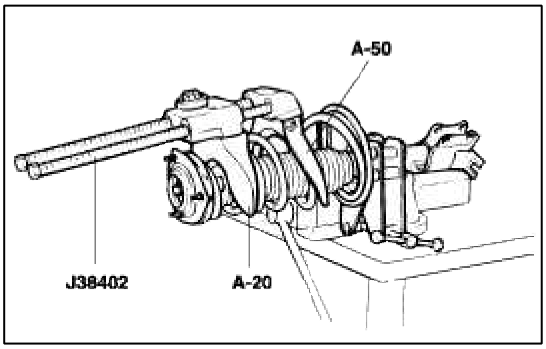
> **CAUTION**
>
> Be careful not to drop the rear strut.

7. Remove the rear strut assembly.

DISASSEMBLY

1. Using the Special Tool, compress the coil spring until there is only a little tension on the strut.

> **NOTE**
>
> Do not use an impact gun.

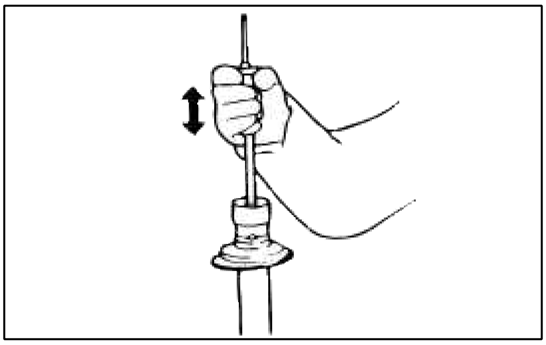

A-50
J38402
A-20

2. Remove the nut at the top end of the shock absorber.
3. Remove the spring upper seat, coil spring, dust cover and strut assembly.

INSPECTION

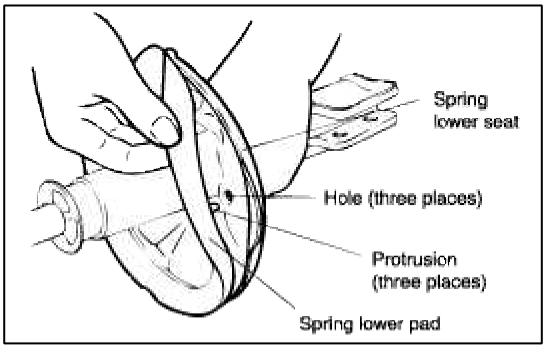
1. Check the insulator for wear or damage.

2. Check the rubber parts for damage or deterioration.
3. Check the coil spring for sagging and weakness.
4. Check the shock absorber for abnornal resistance or unusual sounds.

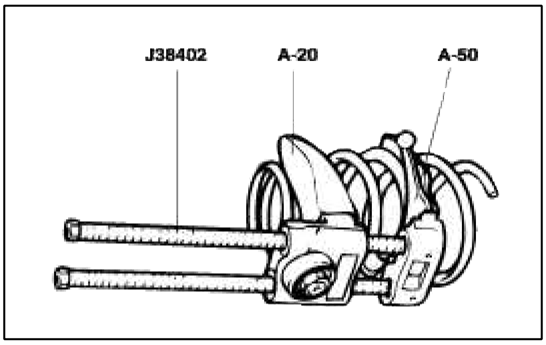


REASSEMBLY

1. Install the lower spring pad so that the protrusions fit through the holes in the spring lower seat.


Spring
lower seat
Hole (three places)
Protrusion
(three places)
Spring lower pad

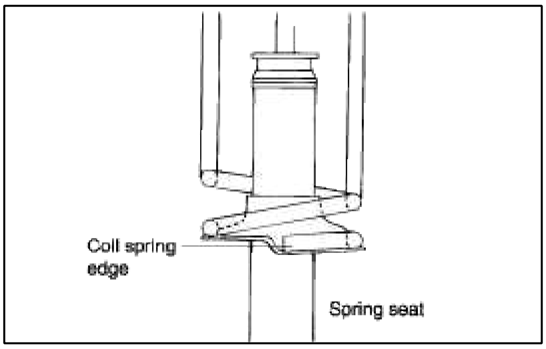
2. Install the dust cover on the shock absorber.
3. Using the Special Tool, compress the coil spring.
   After spring is fully compressed, install it on the shock absorber.


J38402
A-20
A-50

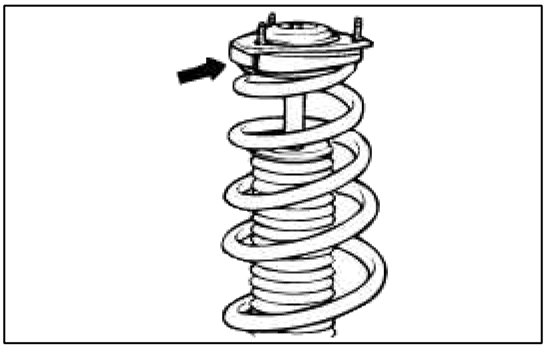
4. After fully extending the piston rod, install the spring seat and insulator assembly.

> **NOTE**
>
> Align the D-shaped hole in the spring seat upper assembly with the indentationon the piston rod.

5. After having correctly seated the upper and lower ends of the coil spring in the upper and lower spring seat grooves, fully install the new self-lockingnut but do not tighten.



6. Position the bolt of the spring seat to align with the projection of the pad as shown in the illustration.



7. Remove the Special Tool.
8. Tighten the self-locking nut to the specified torque.

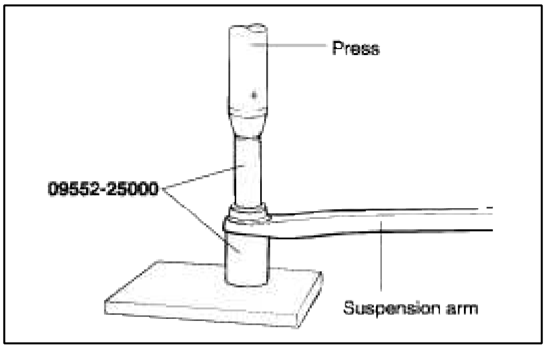
Tighting torque

40-55 Nm (400-550 kg·cm, 29.5-40.6 lb·ft)

Suspension System > Rear Suspension System > Rear Suspension Arm > Repair procedures

REAR SUSPENSION ARM (A,B) BUSH REPLACEMENT

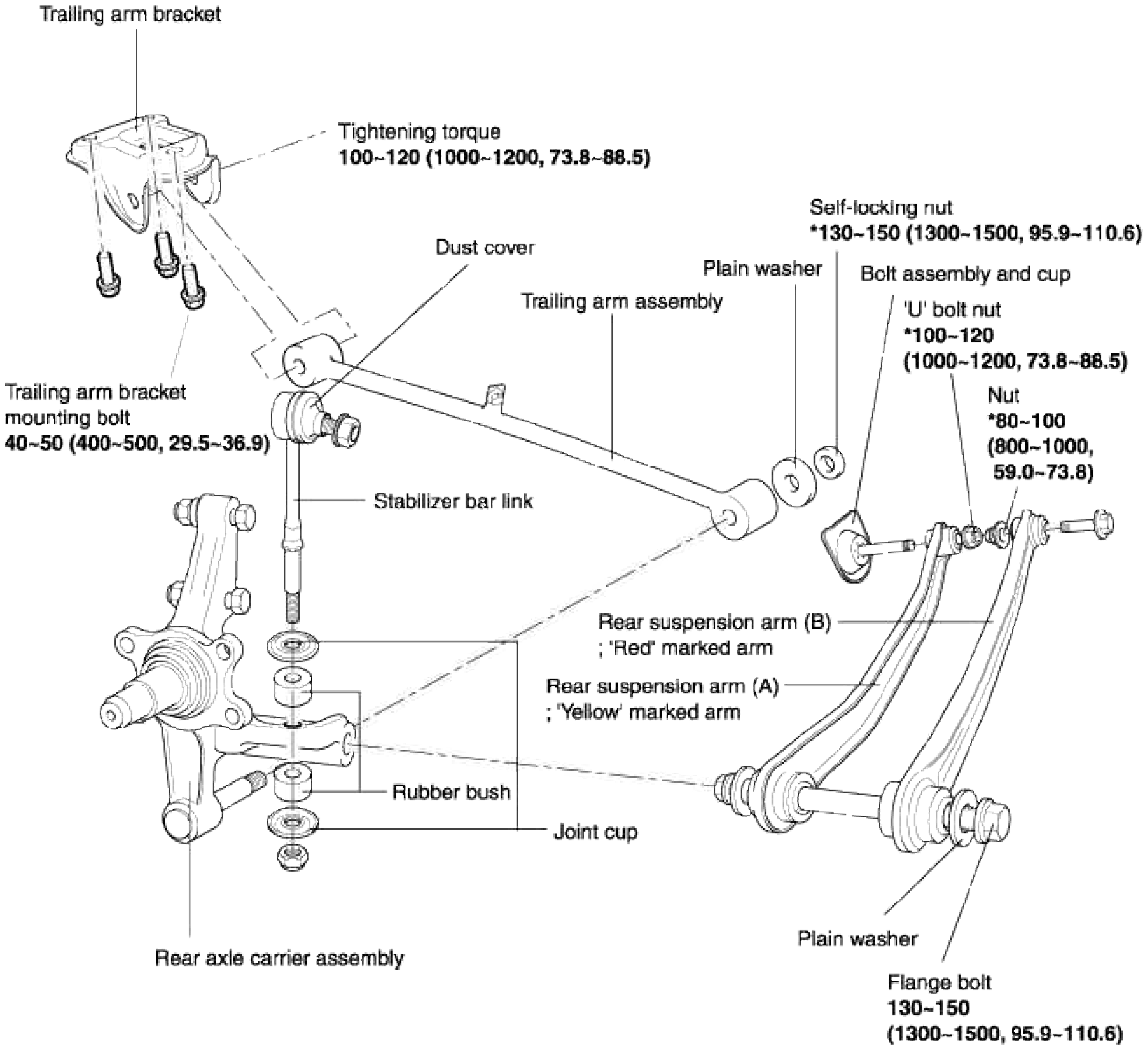
1. Install the Special Tool(09552-25000) and the suspension arm on a press.



2. Press out the bushing.
3. Apply soap solution to the new bushing and suspension arm.
4. Using the Special Tool (09552-25000), press fit the bushing.

Suspension System > Rear Suspension System > Upper Arm, Lower Arm And Assist Link > Components and Components Location

COMPONETS


Trailing arm bracket
Tightening torque
100~120 (1000~1200, 73.8~88.5)
Self-locking nut
*130~150 (1300~1500, 95.9~110.6)
Dust cover
Plain washer
Bolt assembly and cup
Trailing arm assembly
'U' bolt nut
*100~120
(1000~1200, 73.8~88.5)
Nut
*80~100
(800~1000,
59.0~73.8)
Trailing arm bracket
mounting bolt
40~50 (400~500, 29.5~36.9)
Stabilizer bar link
Rear suspension arm (B)
; 'Red' marked arm
Rear suspension arm (A)
; 'Yellow' marked arm
Rubber bush
Joint cup
Rear axle carrier assembly
Plain washer
Flange bolt
130~150
(1300~1500, 95.9~110.6)

CAUTION

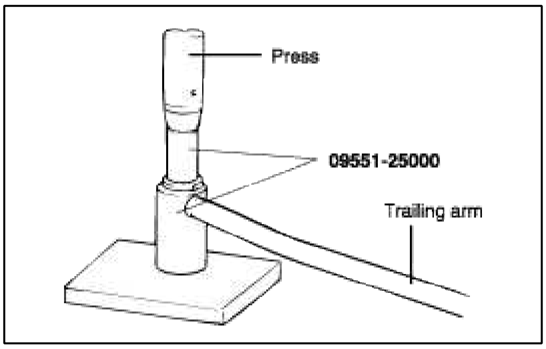
* **Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in an unladen condition.**

TORQUE : Nm (kgf·cm, lbf·ft)

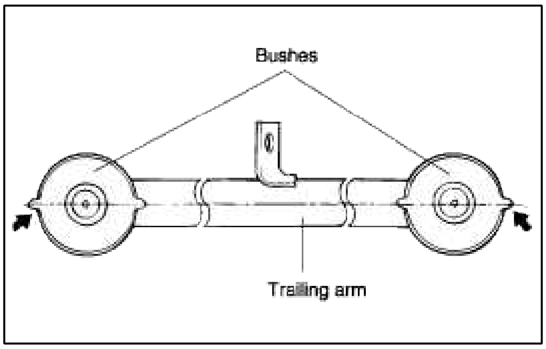
Suspension System > Rear Suspension System > Trailing Arm > Repair procedures

TRAILING ARM BUSH REPLACEMENT

1. Install the Special Tool(09551-25000) and the trailing arm on a press.



2. Press out the bushing.
3. Apply soap solution to the new bushing and the trailing arm bushing mount.
4. Position the projection of the bushing in a line as shown in the illustration.

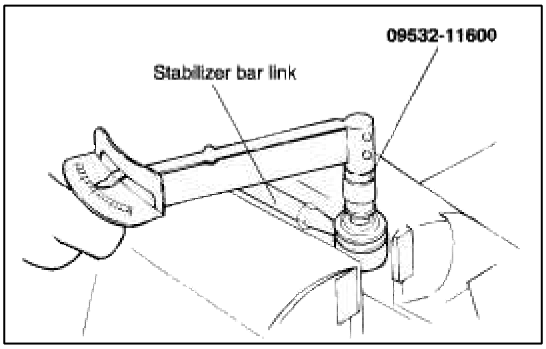


5. Using the Special Tool (09551-25000), press fit the bushing.

Suspension System > Rear Suspension System > Rear Stabilizer Bar > Repair procedures

REAR STABILIZER BAR

1. Remove the stabilizer bar and link assembly.
2. Check the stabilizer link ball joint rotating torque.



A. If there is a crack in the dust cover, replace it and add grease. (refer to 'Lubricants'. See page SS-p.4)

B. Shake the stabilizer link ball joint stud several times.

C. Mount the self-locking nut on the ball joint, and then measure the ball jointrotating torque.

Standard value

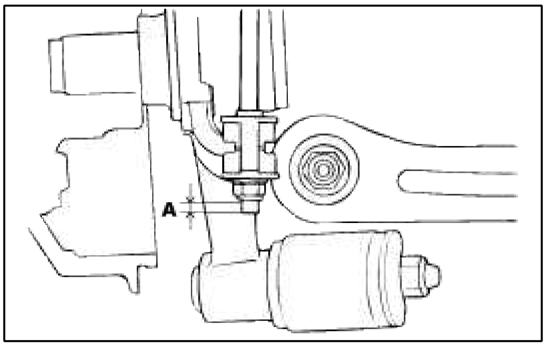
0.3-1.0 Nm (3-10 kg·cm, 0.22-0.73 lb·ft)

D. If the rotating torque exceeds the upper limit of the standard value, replace the stabilizer link.

E. Even if the rotating torque is below the lower limit of the standard value,the ball joint may be reused unless it has drag and excessive play.

3. Install the stabilizer link lower mounting nut so that the distance (A) is at the standard value.

Standard value (A) : 4-6 mm (0.157-0.236 in.)



Suspension System > Tires/Wheels > Tire > Repair procedures

TIRE WEAR

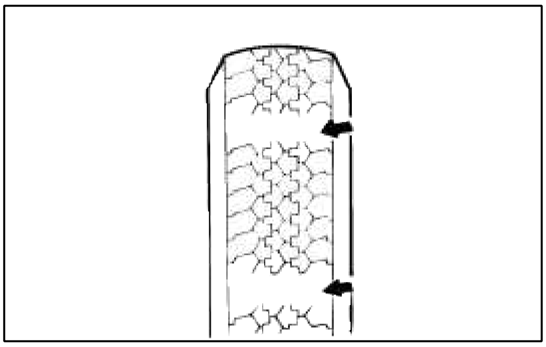
1. Measure the tread depth of the tires.

Tread depth of tire [Limit] : 1.6mm (0.06 in.)

2. If the remaining tread depth is less than the limit, replace the tire.

NOTE

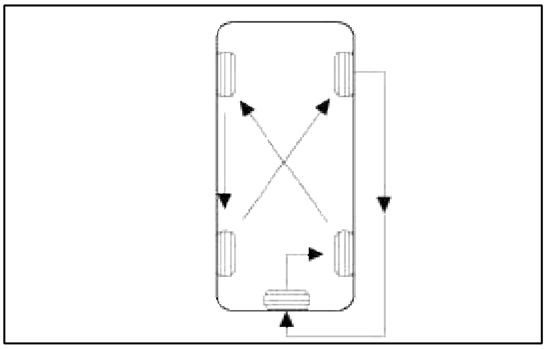
When the tread depth of the tires is less than 1.6 mm (0.06 in.) the wear indicators will appear.



TIRE ROTATION

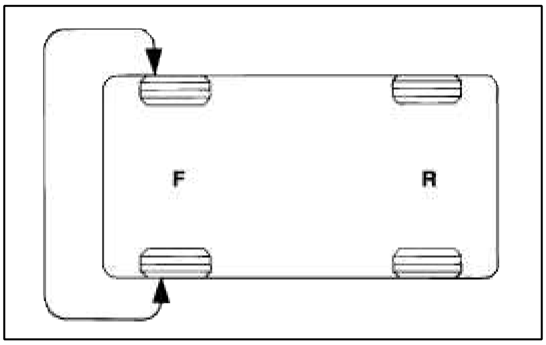
NOTE

The temporary spare tire should not used in the wheel rotation.

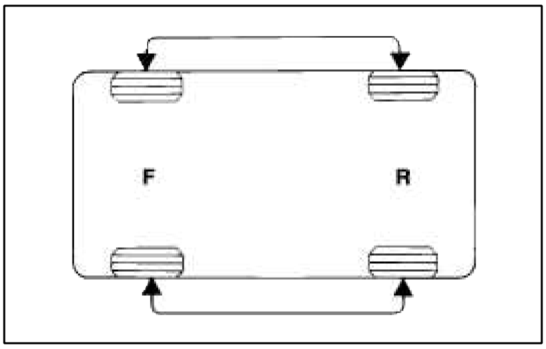


CHECKING FOR PULL AND WANDER

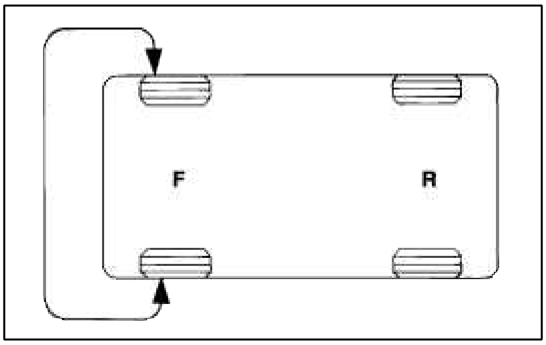
1. Switch the front right and front left tires, and perform the road test inorder to confirm vehicle statility.



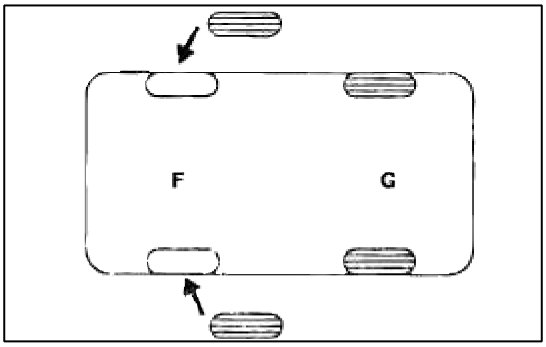
2. If the steering pulls to opposite side, switch the front and rear tires, and again perform the road test.



3. If the steering continues to pull to one side, switch the front right and left tires again, and again perform the road test.



4. If the steering continues to pull to the opposite side, replace the front wheels with new ones.



TIRE CHAINS AND SNOW TIRES

1. Use tire chains only on the front wheels. Do not use tire chains on rear wheels.
2. When using snow tires, use them on all four wheels for maneuverability and safety.

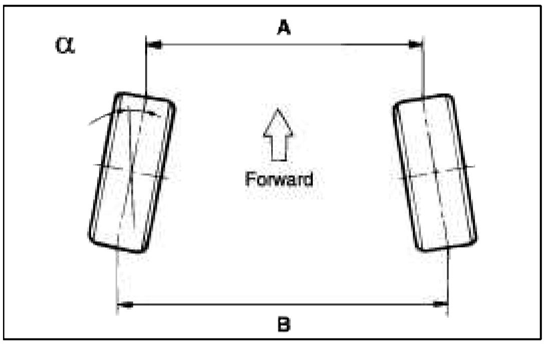
Suspension System > Tires/Wheels > Wheel > Repair procedures

FRONT WHEEL ALIGNMENT

TOE-IN

Standard value
Toe-in (B-A): 0±3 mm (0±0.12 in.)

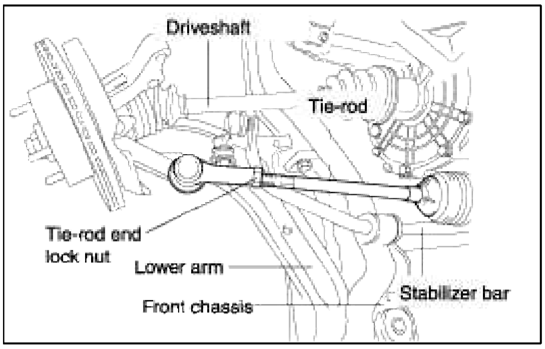
Description		Toe changes mm (in.)/deg.
No. of turns of tie rod (Same amount for right and left)	1/2	Approx. 5.5(0.217)/32.5′
	1	Approx. 11(0.433)/1°


α
A
Forward
B

NOTE

- Toe-in adjustment should be made by turning the right and left tie rods by the same amount.
- When adjusting toe-in, loosen the outer bellows clip to prevent twisting the bellows.
- After the adjustment, tighten the tie rod end lock nuts firmly and reinstall the bellows clip.

Tightening torque
Tie rod end lock nuts:
50~55 Nm (500~550 kgf·cm, 36~40 lb·ft)

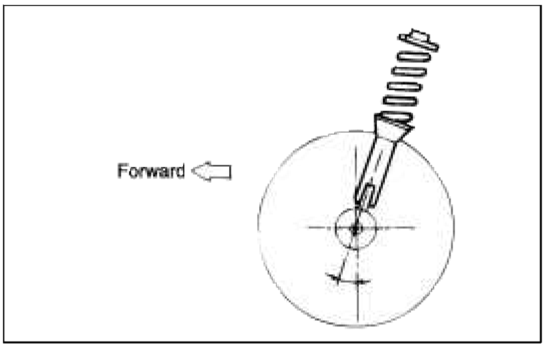

Driveshaft
Tie-rod
Tie-rod end lock nut
Lower arm
Front chassis
Stabilizer bar

CAMBER

Standard value
Front camber: 0° ± 30′

CASTER

Standard value
Front caster: 1°48′ ± 30′



NOTE

1. The front suspension assembly must be free of worn, loose or damaged part sprior to measuring front wheel alignment.
2. Measure wheel alignment by using the special tool (09529-21000).
3. Camber and caster are pre-set at the factory and cannot be adjusted.

REAR WHEEL ALIGNMENT

TOE-IN

Standard value
Rear toe-in: 3 ± 2mm (0.12 ± 0.079 in.)

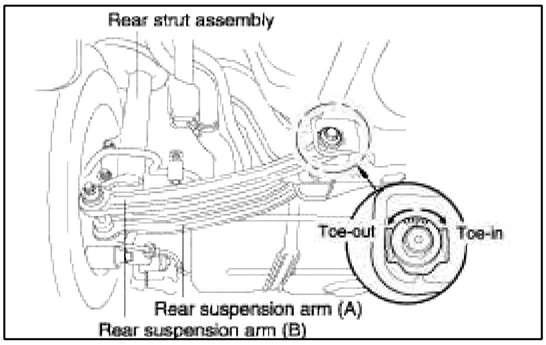
NOTE

- Release parking brake for the better measurement.
- The rear suspension arm (B) mounting bolt should be turned an equal amount on both sides when adjusting.

Inside of the vehicle: toe-in
Outside of the vehicle: toe-out
The scale has graduations of approximately 2.4 mm (0.09 in.)
(single side toe angle quivalent to 14′)

CAUTION

The eccentric bolt should be adjusted within a 90° range left and rightfrom the center position.



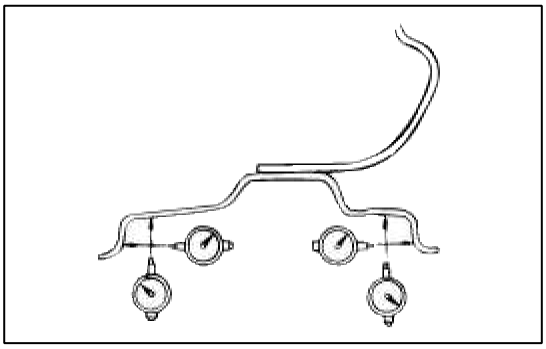
CAMBER

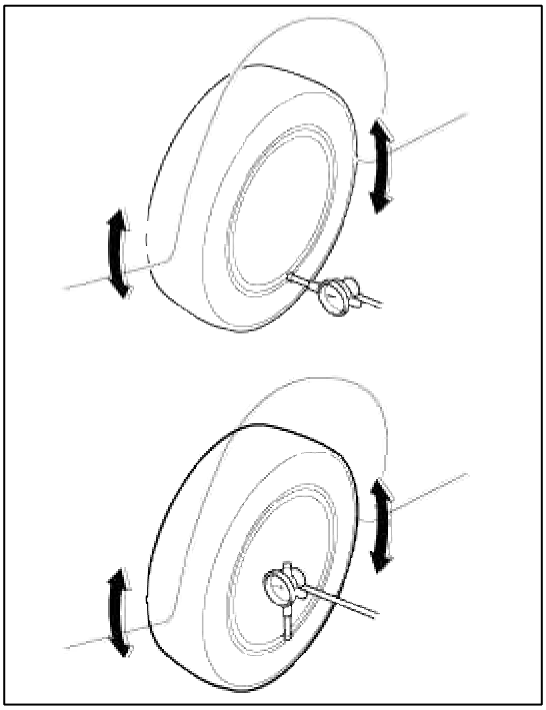
Standard value
Rear camber: -41′ ± 30′

Rear camber is also pre-set at factory and can not be adjusted.
If the camber measured is not within the standard value below, replace the bent or dmaged parts.

WHEEL RUNOUT

1. Jack up a vehicle and support it with a jack stand.
2. Measure the wheel runout with a dial indicator as illustrated.





3. Replace the wheel if the wheel runout exceeds the limit. (refer to 'SERVICE STANDARD'. see page SS-p.3)

Wheel runout [Limit]

Steel wheel
- Radial : 0.6mm (0.028 in.) : Average of LH & RH)
- Axial : 0.8mm (0.032 in.)

Aluminum wheel
- Radial : 0.3mm (0.012 in.)
- Axial : 0.3mm (0.012 in.)

WHEEL NUT TIGHTENING

1. Tightening torque.
   Steel and aluminum alloy wheel.

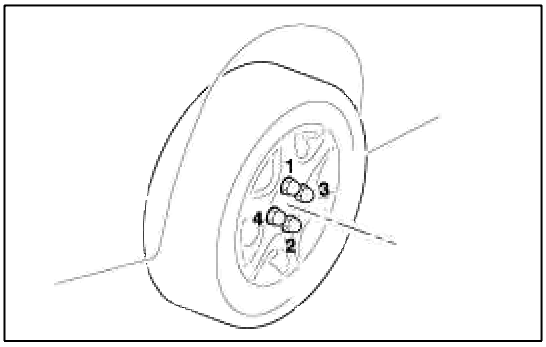
Specified torque

90-110 Nm (900-1,100 kg·cm, 65-80 lb·ft)

CAUTION

When using an impact gun, final tightening torque should be checked using a torque wrench.

2. Tightening order.
   Go around the wheel tightening every other nut until they are all tight.
   Then double-check each nut for tightness.



INSTRUCTIONS FOR ALUMINUM TYPE WHEELS

1. Aluminum is vulnerable to alkalies. If the vehicle has been exposed to automobilewashing detergent, or salt from sea water, or road chemicals, rinse the vehicleas soon as possible. Then apply wax to the wheels to prevent corrosion.
2. When steam cleaning the vehicle, do not direct the steam onto the aluminumwheels.
   When tightening nuts for aluminum wheels, observe the following :
   (1) Clean the hub surface.
   (2) After finger-tightening the wheel nuts, tighten to specifications.
   (3) Do not use an impact gun or push the wrench by foot to tighten the wheel nuts.
   (4) Do not apply oil to the threaded portions.